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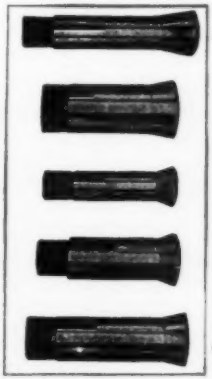

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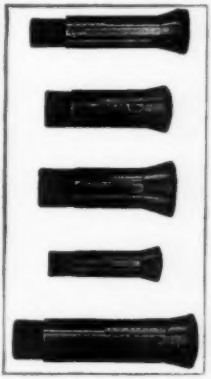

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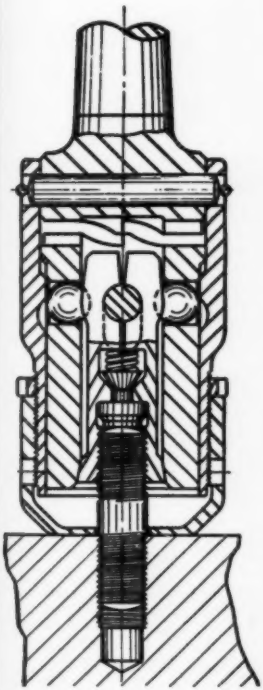

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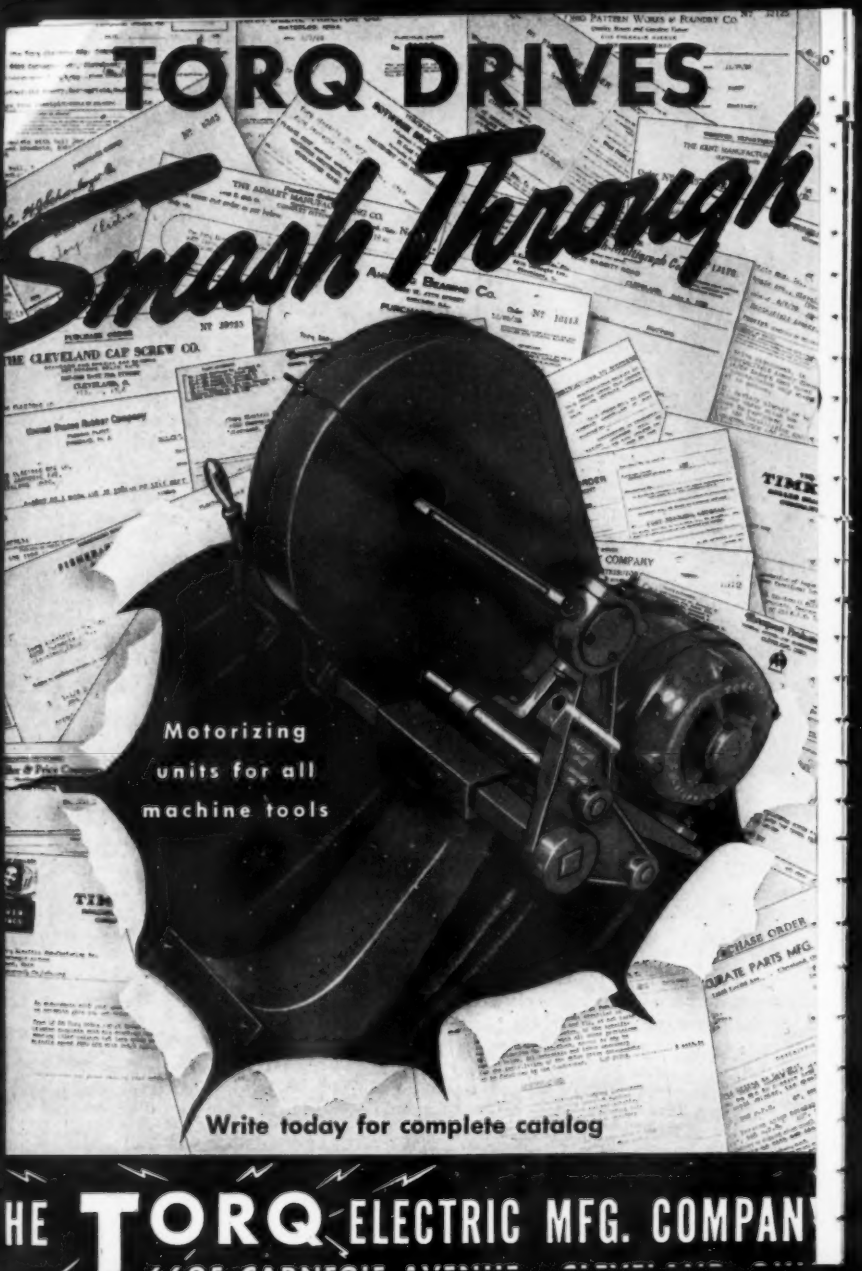
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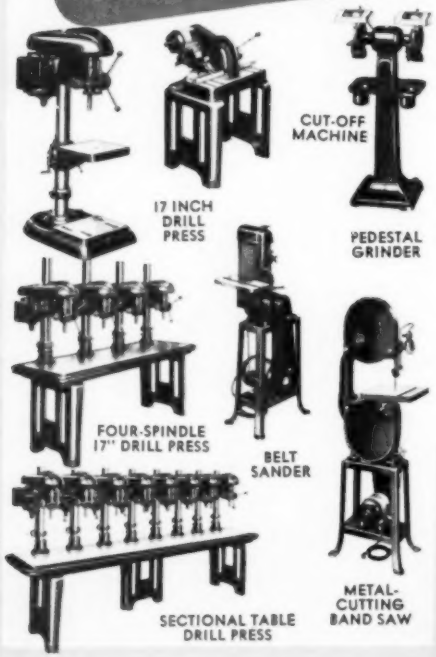

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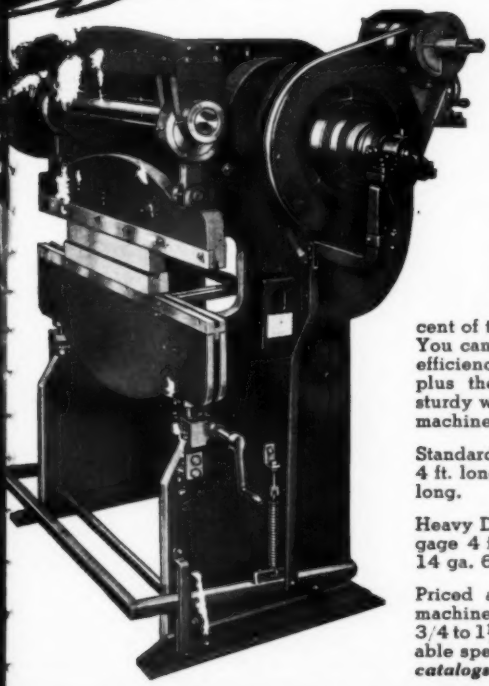

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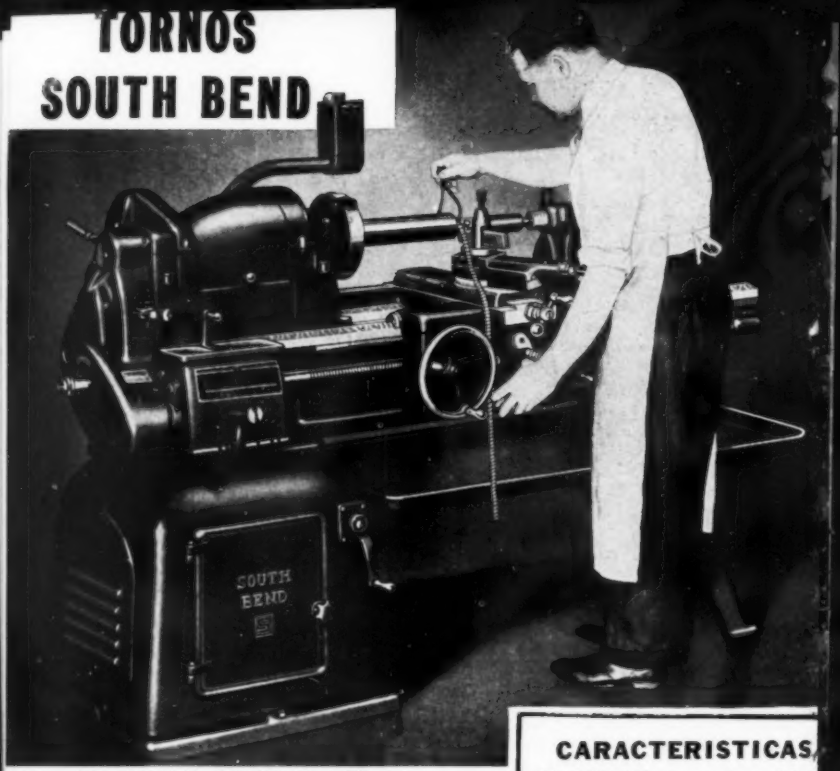

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The Editor's Page

ALREADY, a lot of changes will be necessary in our geographies. Many small European countries have been enveloped by the Nazi hordes — losing identity, culture and liberty.

Britain alone is battling bravely against heavy odds. Headlines in the days to come will reveal how well she continues to resist the Nazi impact.

We must face realities though, and if Britain should fall, that may bring the war to our doorstep —in Canada, and the Monroe Doctrine opposes geographical changes in this hemisphere.

Our belated though ambitious defense program is under way. Nothing must be allowed to delay its progress.

From the events that have gone before—from the lessons of the first world war, we must follow an orderly plan, analyzing and providing for every possible contingency — coordinating all of our defense efforts. Obstructions must be eliminated along with lost motion and "bottle necks."

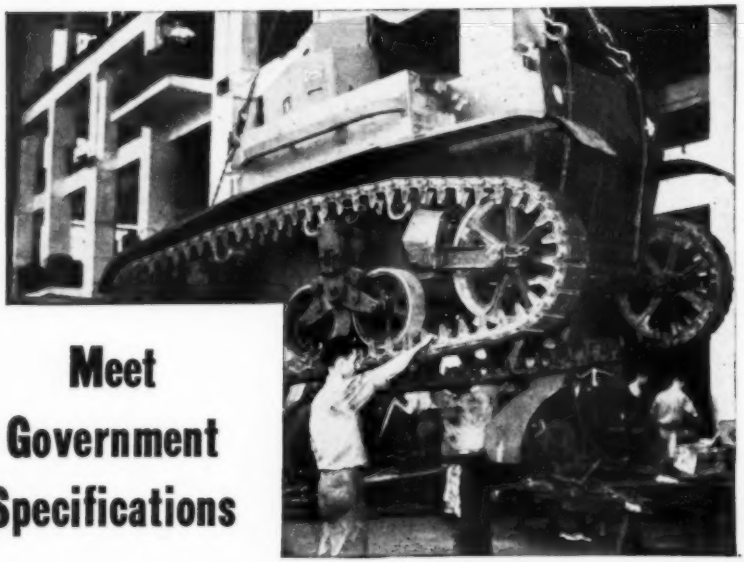
There would be less urgency had we devoted more time and money to defense preparations—and less to "leaf raking." Then we might have been spared the spectacle of training the National Guard with wooden guns and trucks labeled "Tanks."

We'll have to develop man power, as well as machines. That means we'll all have to take off our coats and go to work. Leisure and play are all right in their places, but hardly when the country is in peril — as some of the conquered nations of Europe found to their sorrow.

Even if we are lucky enough to keep out of actual conflict in the near future, we cannot afford to be poorly armed in a world ruled by force. At the very least, we are faced with the prospect of a bitter trade war that will tax the skill and resourcefulness of our manufacturers, competing with modern European factories and far lower labor costs.

Paraphrasing Confucius:—"No planes, no guns, no defenses—no liberties!"

Wesley G. Paulson



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Low Temperature Brazing

A Review of the Standard Silver Brazing Alloys Developed During the Past 15 Years and Used Extensively in Industry

By ROBERT H. LEACH, Vice President
Handy and Harman, Bridgeport, Conn.

IT IS doubtful whether many persons realize the extent to which silver alloys are used today in brazing both ferrous and non-ferrous metals and alloys. The quantities used are small in comparison with base metal brazing alloys, but the amount of joining that is being done with silver brazing alloys is impressive, because the best results are obtained when the joints are closely fitted and a much smaller quantity of the alloy is used than is the case with the V joints or heavy filleted joints which are common to base metal brazing or soldering.

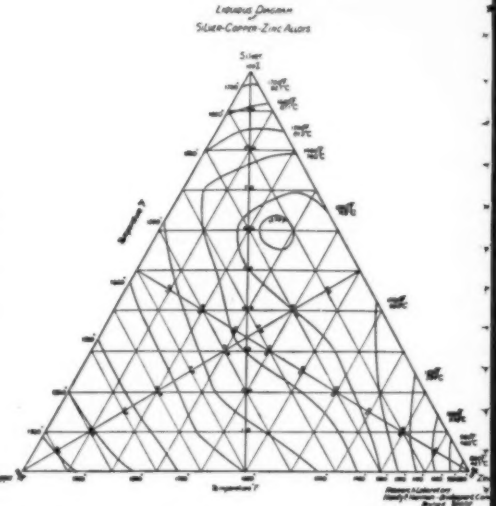
Silver brazing alloys have been used for centuries by metal workers, particularly in the silverware industry and for making joints in cases where strength and resistance to shock were required, such as joining band saws, shrouds and lacing wire for turbine blades, and in the fabrication of equipment where appearance as well as strength was important. Usually, they have contained varying percentages of silver, copper and zinc and were called "silver solders." These compositions had melting points from 1300 to 1600° F. depending upon the proportions of the different metals, or a range below that of base metal brazing alloys, or copper welding rods which required from 1600 to 2000° F.

About 15 years ago, the industrial use began to show considerable increase and the interest was sufficient to cause the American Society for Testing Materials to draw up specifications for a group of standard alloys. These stand-

Figure 1—Using a small multi-flame torch for the convenient and economical brazing of small parts.

ard specifications were finally accepted and published in 1929 and are given in Table 1.

The alloys are called "silver solders" in these specifications, and although this name is used widely, it is believed by many that the name, silver brazing alloy, is preferable because the term solder is likely to be construed as referring to soft solders, which are used in large quantities in industry and melt at approximately 400° F. Brazing on the other hand, suggests higher melting temperatures than soft solders and greater strength of joints which are characteristic of these silver brazing alloys.



The eight grades given in Table 1 were selected after a large amount of testing had been done to determine the range of compositions required to meet the different industrial requirements. The ternary diagram of the flow points of silver, copper and zinc alloys is shown above. It is evident from a study of the diagram that without some attempt at standardization, there would be a tendency for the production of a large number of different compositions with no material benefit to the consumer. In fact, one of the principal reasons for setting up these standards was to eliminate many compositions which had accumulated over a long period of time, and varied so slightly from each other that there was no justification for making all of them.

The question that immediately arises is why the use of these more expensive alloys should show such a large increase. The answer is two-fold:—first, the demand on the part of those industries engaged in fabricating articles and equipment from sheet metal and tubing, for better and quicker methods of joining; and second, the comparatively low melting points of these alloys, their free flowing properties and the strength of joints made with them.

As might be expected, increase in the use of standard alloys encouraged ex-

TABLE I—STANDARD ALLOYS SPECIFICATIONS

Grade No.	Silver %	Copper %	Zinc %	Cadmium %	Impurities Max. %	Melt. Point °F.	Flow Point °F.	Color
1	10	52	38	a	0.15	1510	1600	Yellow
2	20	45	35	a	0.15	1430	1500	Yellow
3	20	45	30	5	0.15	1430	1500	Yellow
4	45	30	25	nil	0.15	1250	1370	Nearly white
5	50	34	16	nil	0.15	1280	1425	Nearly white
6	65	20	15	nil	0.15	1280	1325	White
7	70	20	10	nil	0.15	1335	1390	White
8	80	16	4	nil	0.15	1360	1460	White

(a) The addition, not to exceed 0.50 per cent of cadmium to assist in fabricating Grades No. 1 and 2 shall not be considered as a harmful impurity.

tensive research and the development of other silver alloys for brazing. There was a demand for alloys with even lower melting points without sacrificing strength or the free flowing properties of the standard alloys. Moreover, there are certain corrosive conditions where the presence of zinc might be harmful, and in other cases copper might be undesirable. The result has been that we have available today, silver brazing alloys, in which other metals, such as cadmium, manganese, tin, nickel and phosphorus are used to give special properties.

Some of these alloys have been patented but they are used to such an extent both in this country and foreign countries, that any article dealing with the development of silver alloy brazing would not be complete without mention of the characteristics of some of them. The silver copper eutectic which contains 72% of silver and 28% of copper melts at 1435° F. and is used when zinc in the alloy would give trouble. Alloys containing silver, copper, manganese and those with a further addition of nickel and silicon are used for similar purposes. Zinc or zinc and cadmium combined with relatively high percentages of silver provide a series of alloys that melt at temperatures between 1300° and 1400° F., have a white color and are used for those conditions where copper would be objectionable. A patented alloy containing silver, copper, zinc and cadmium which flows freely at 1175° F., is used extensively for joining both ferrous and non-ferrous metals and alloys, because it flows very freely at this temperature, and makes strong joints. Another patented alloy contains silver, copper and phosphorous and flows freely at 1300° F. Phosphorous makes the alloy self-fluxing to a considerable degree and it is used with copper and copper base alloys, but it is not recommended for steel or iron because of the brittle phosphide of iron produced in the joint.

Selection of Grade and Form of Brazing Alloy

There is no definite rule to follow in selecting the grade of silver brazing alloy, as several different factors have to be considered, among which are:—metals to be joined, corrosion conditions, type of joint and stresses that may be applied.

In the standard silver copper zinc series given in Table 1, the silver content will run from 10% to 80% and those with the lower percentages of silver have the highest melting points and contain relatively high percentages of zinc. These low grade alloys cost less per unit but it must be remembered that much of the advantage from the use of a silver brazing alloy is lost, because of the high temperatures required to melt them. It should also be emphasized that the lower first cost of the alloy does not mean that the total cost of making the joint will be less. By taking proper care in the design and fitting of the joint, such a

Figure 2—Application of a large two-flame No. 10 tip for heating a large flange assembly.

small amount of alloy is used, that the saving in time and fuel will more than offset the higher cost of a more expensive alloy with lower melting point. There is also a much greater margin of safety from damage to the metals when the alloys with lower melting points are used.

As far as melting point is concerned, a silver copper zinc alloy containing 10% silver does not have any material advantage over the common brazing or spelter alloys, but it contains about 12% less zinc and as it is malleable and ductile, it can be rolled into thin strips and drawn into fine wire. It is sometimes used when quenching at temperatures of about 1300° is done after joining, and with copper and copper base alloys when first cost seems to be the controlling factor, and it is felt that the heating will not cause excessive grain growth or other damage.

Figure 3—Brazing of a bus bar assembly. Ground connections and cable joints are also made.

The 20% silver alloy in this group is used on copper and copper-base alloys, also on steel and dissimilar metals. It has a yellow color and as it flows freely at 1500°F., it can be used for brazing extruded bronze when reasonable care is taken in heating the joint.

With 30% of silver and above, we obtain more benefit from the low melting temperatures due to the silver content and we can use a lower percentage of zinc. Alloys containing from 40 to 50% of silver and from 25 to 16% zinc are probably the most widely used of the silver copper zinc group. They are used on ferrous and non-ferrous metals and alloys, and melt at temperatures around 1400° depending upon the exact composition used. An alloy containing 50% silver, 34% copper and 16% zinc is a standard that has become generally accepted in place of a number of other alloys of aproximately this composition that were made before the A. S. T. M. standards were established.

The alloys in this series which have the lowest melting points, contain from 60 to 65% silver and are white in color. Silversmiths use these grades and with 15% zinc, they melt at 1325°, and are used in other industries for joining small parts and light weight tubing and sheet.

When even greater ductility is required, the silver can be further increased and the zinc lowered and an alloy containing 80% silver, 15% copper and 4% of zinc is used for joining copper rods that are to be drawn into fine wire and also for making trolley wire.

Silver brazing alloys have a higher electrical conductivity than base metal brazing alloys and their use is therefore particularly desirable for brazing parts of electrical apparatus where the highest conductivity is required. Zinc tends to lower the conductivity and the silver copper eutectic previously mentioned has about 70% of the conductivity of copper.

Tests by Reed and Edelson showed that with lap joints having a lap 1½ times

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the thickness of the copper bar joined. the resistance was less than that of the copper bar, and with butt joints, the resistance was only increased slightly. The alloy used in these tests contained 50% silver, 34% copper and 16% zinc and by using an alloy with a higher percentage of silver and low zinc, the resistance would be less.

Any of the standard silver brazing alloys are resistant to most of the common types of corrosion. When unusual conditions have to be met it is desirable to make up specimens and subject them to the actual conditions of use in order to determine the best alloy. Galvanic corrosion is a problem, but as it is generally in proportion to the areas exposed to attack, a cathodic joining alloy would give the best result. Silver alloys with high percentages of silver are cathodic to many metals and alloys used to resist corrosive conditions and therefore are satisfactory for use under such conditions. For example, these high grade silver alloys are cathodic to Monel metal and stainless steel under many corrosive conditions for which these metals are used. They should not be used, however, for joining stainless steel when the joints are likely to be attacked by nitric acid.

In addition to the standard silver alloys, the engineer has a further selection from the proprietary alloys that have been developed and the two that were described in previous paragraphs are suitable for a wide variety of applications. Their low melting points have made them very acceptable because of the speed at which joints can be made and the large factor of safety against damage from over-heating.

The question of color match with different metals and alloys is often raised. Those silver brazing alloys with low percentages of silver are yellow and the color becomes whiter as the silver is increased. Alloys without any copper and high silver are the whitest, but the band of brazing alloy which is visible in a properly fitted joint is so narrow that any slight difference in color is generally a negligible factor.

Having selected the grade of alloy, the question of the form that is best suited for any particular application is most important. The malleability and ductility of silver brazing alloys allow them to be produced in any form that will be most convenient and economical to use.

There is a rapidly growing use of inserts of these alloys because by preplacing them before heating the following advantages are obtained:

1. Control of the amount of alloy used, thus eliminating waste.
2. Better assurance that the alloy will be properly distributed over the joint surfaces and all parts will be wetted.
3. The appearance of the alloy at the edge of the joint is a good indicator that the joint has been heated sufficiently to insure a good bond.
4. In furnace or salt bath heating, inserts are necessary, and it is possible to make up assemblies having a larger number of joints that can be heated at the same time.
5. When the heating is done with torches, the workman can give his whole attention to applying the flame evenly and careful control of temperature.
6. Neatness of joints and no spills of the brazing alloy on the surface away from the joint..

Inserts may be thin sheets, washers, and rings of either round or rectangular wire. Filings or powdered silver brazing alloy can be spread along the joint.

A thin layer of the alloy can be flushed over the joint surface of one of the members before assembling.

The size of wire or strip selected when the workman has to feed it into the joint is not always given the attention it deserves. If wire or sheet of too large a cross section is used, there is likely to be a waste of the alloy, and if it is too small the workman is inconvenienced by having to feed in too great a length. Care in choosing the right size will result in lowering costs and making better and neater joints.

Fitting, Cleaning and Assembling

Procedures for using silver brazing alloys are given in detail in the different papers listed at the end of this paper, and only a brief summary will be attempted.

Silver brazing alloys flow freely into narrow openings and clearances of a few thousandths of an inch should be maintained to produce the strongest joints. Fig. 4 illustrates the effect of joint clearance on strength. The surfaces of the joint should be clean, and free from all grease, dirt and oxide scale.

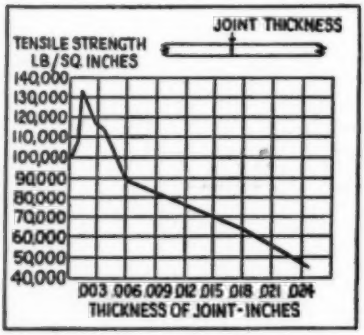


Fig. 4—Relation of joint thickness to tensile strength based upon butt joints of stainless steel.

The important point to keep in mind is that we must have a clean, nascent metal surface, that will be wet evenly by the brazing alloy. Any film that prevents the wetting of the joint surfaces will prevent a strong bond. After all grease has been removed, the surface can be cleaned with emery cloth or pickled with a suitable solution to remove any scale or highly polished surface that has resulted from rolling or drawing. Webber, in an excellent paper on Electric Furnace Brazing, explains fully the difficulties of trying to get brazing alloys to flow on highly polished surfaces and a slight roughening by either mechanical or chemical means is a great help to good bonding.

When joining flat members either with lap or butt joints, it is desirable to grind or machine the surfaces of the joint so that they may be held parallel and equidistant from each other. If thin sheet inserts are used the parts should be clamped together with enough pressure to hold them firmly together after the alloy has melted.

When tubular members are joined, this presure cannot be applied and there is nothing to break down the surface tension of the molten alloy and cause it to flow except gravity and capillary action. It is in joints of this type that the preparation of the joint surfaces must be given particular attention in order that the molten alloy will wet them and spread evenly. If the space is too great, the capillary action will not be sufficient to cause proper spreading and if the surface is not wet with the alloy this action is also ineffective. Unless care is taken to prepare and fit joints of this type, parts of the surface may become wetted and the brazing alloy will flow through in irregular channels and even form a fillet at both ends of the joint, thus giving the appearance of a good bond when actually, only a very small portion of the joint surfaces are bonded together.

After the members have been fitted and cleaned properly, the joint surfaces should be protected with a film of flux. This flux must be fluid and chemically active at the melting point of the brazing alloy and be spread over the entire surface. It is also advisable to protect the brazing alloy with flux when it is fed into the joint.

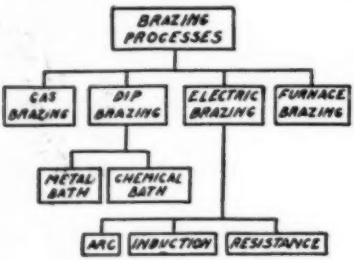
Borax or combinations of borax and boric acid are used, but specially prepared fluxes that are fluid and active at lower temperatures are available, and are preferred for the lower melting point alloys. These proprietary fluxes are composed of chemicals that dissolve refractory oxides readily, and should be used with stainless steels. A flux that has been particularly successful for use with silver brazing alloys is supplied in paste form and can be brushed along the joint to insure proper coverage.

Jigs should be provided to hold the parts in proper relation during heating. Some types of assemblies require little support but the members should be held together firmly so that no strain will come on the joint until it has cooled to a temperature well below the melting point of the brazing alloy. When the necessary care is taken in

supporting the joint members, the workman is free to devote all of his attention to applying the torch flame and he can do much better work in less time.

Heating

There are several different methods of supplying the heat necessary for brazing, and the chart given in Fig. 5 was adopted by the American Welding Society.



These different methods of heating are also described more fully in the appended list of papers and only gas brazing will be discussed to any extent at this time.

Gas brazing includes all combinations of torch brazing such as oxyacetylene, oxyhydrogen, oxygen and city gas, natural gas and gases such as butane or propane; also air acetylene and air with other gases mentioned.

The air gas and air acetylene torches will give satisfactory results with small parts and the large torches or those with multiple flames may be used on fairly large work. However, the tendency to use an oxidizing flame in order to heat the work quickly with air torches is one of their disadvantages for use with silver brazing alloys.

Fortunately we have the oxyacetylene torch which has been highly perfected and can be obtained in a great variety of sizes and types. It is probably the most widely used torch where rapid heating is an advantage, and it has great flexibility in the hands of a skilled operator.

Because of the high temperature of the oxyacetylene flame, there is no need for the operator to be tempted to run it on the oxidizing side, and he can obtain all the heat required and still keep to the softer flame a little on the reducing side of neutral. It might be compared with the modern eight cylinder automobile engine, and the air gas torch with the old two cylinder engine of years ago. There may be some basis for the argument that an unskilled operator can do less damage with an air gas torch, but what we are really concerned with when brazing with silver alloys is an effective means for quickly and evenly heating the joint with a neutral or reducing flame. Of course, care must be taken in the use of the oxyacetylene torch to keep it in motion and not let it play too long on one spot, but an intelligent workman will soon master the proper technique and he then has an instrument that will enable him to control the heating most efficiently.

Large units can be installed for supplying the oxygen and acetylene and portable small units are made for small plants or field work. Servicing and supplies can be obtained quickly in all parts of the country.

The manufacturers of oxyacetylene torches are always willing to cooperate in the design of special tips or torches with multiple tips to meet any specific requirements.

They can be used for such extreme conditions of heating as the silver alloy brazing of fine wires in Fourdinier screens on the one hand to brazing 42" in diameter flange joints on the other.

Figure 2 shows a two flame No. 10 Tip heating a large flange assembly and Fig. 1, a small multiflame torch for small parts.

To obtain the full benefit from these low temperature silver brazing alloys, the workman should be trained to observe the rate at which different metals become heated to the brazing temperature and give particular attention to the relative mass of each of the members that is being brazed. Metals of high heat conductivity, such as copper, should be preheated some distance from the joint and if there is much difference in the size of the parts

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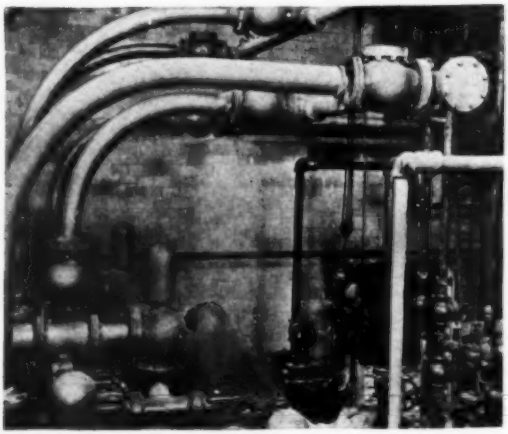

Fig. 6—A typical installation of silver alloy brazed piping and fittings in a steam plant.

then the one with largest cross section should be given the most heat.

Unless inserts are used, the joint surfaces should be heated to a temperature at which the brazing alloy will flow freely before attempting to feed the alloy into the joint. Although it is not advisable to keep the torch flame on the molten alloy and the expression "let the heat in the joint melt the alloy" is often used, a skilled workman can take advantage of the heat of the flame to melt the alloy, which then flows quickly into the joint. In all cases, however, the joint surfaces must be heated above the flow point of the alloy or a good bond will not be made. When the joint members vary greatly in thickness, as obtained when thin wall piping is brazed into a heavy flange, care must be taken to heat the flange until the inner surface which joins the pipe is at the correct temperature for the particular brazing alloy that is being used.

Probably one of the most difficult things that the workman has to acquire is the ability to judge when the joint is at the required temperature, and at the same time not overheat the joint. Benches placed before windows are not good places to work because of the extreme variations in light conditions and strong drafts are also bad. The appearance of the flux is a guide, but if one is using a flux that is fluid at a temperature several hundred degrees below the proper brazing temperature, the best indicator is to touch the alloy to the heated joint. In order to speed up the work there is a tendency to overheat the joint with consequent damage and workmen should be trained to judge the heat with reasonable accuracy.

APPLICATIONS IN DIFFERENT INDUSTRIES

Electrical:

Transformer leads and taps are brazed with silver alloys because of the low temperatures at which strong shock resistant joints of high conductivity can be made.

Joints in bus bar installations of all kinds are being made with these alloys because of the high strength, corrosion resistance and elimination of voltage drop. Figure 3 shows a bus bar assembly being brazed. Ground connections and cable joints are also made.

In the manufacture of electric motors, end rings are bonded to rotor bars and many small parts in the manufacture of electrical equipment are brazed with silver alloys.

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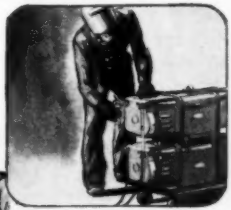

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Household Refrigerators and Air Conditioning:

One of the largest new developments in the use of silver brazing alloys is in the manufacture of refrigeration units, both household and for industrial plants.

The low temperatures at which they melt and the strong corrosion resistant joints, make them particularly desirable for joining the light metal sheets and tubing which are used in this industry. Joints are leakproof and when proper attention is given to design the cost is remarkably low.

The use of these alloys in air conditioning systems is extending rapidly, and has eliminated the old breakdowns that occurred with soft soldered joints which were often serious and caused damage from the escape of the refrigerant.

Piping:

Standard pipe and fittings up to 10" or more in diameter are now being joined in increasing volume with these alloys. Tests on joints made in this manner have not failed when the work was done properly. Special fittings are being made with rings of silver brazing alloy fitted into grooves cut in the fittings, and this type of joint is being specified for marine and navy piping, and piping in buildings. Installations of silver alloy brazed pipe and fittings in large steam plants have been in use for several years, and have given complete satisfaction. Fig. 6 shows a typical illustration.

Joints made with silver brazing alloys on both similar and dissimilar metals for steam lines and boiler construction have been subjected to extreme tests entirely beyond anything to be expected in use and no signs of failure occurred in the brazed joints. One example is a steam boiler having 1237 copper tubes joined to mild steel headers 48" in diameter and ¾" thick. Brazing was done with a silver alloy melting at 1175° F. and under test, this boiler was fired to 225 lbs. pressure, steam and water blown out and cold water immediately pumped into the dry hot boiler. Repeated firing and cooling showed no failure in the brazed joints. Similar tests on assemblies of heavy wall copper tubing and fittings brazed with an alloy melting at 1300° F., showed no failure when subjected to a steam pressure of 200 lbs. per square inch and followed by the in-

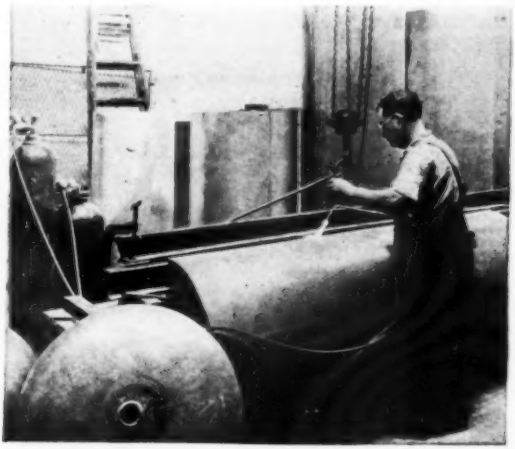

Fig. 7 — Oxyacetylene brazing a copper hot water tank with a silver brazing alloy which melts at 1300° F.

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troduction of cold water for many repeated cycles.

Another unusual application was the construction of underground gas mains from heavy wall copper tubing, using butt joints brazed with the silver copper phosphorus alloy, previously mentioned. Ordinarily a bell and spigot type of joint would be used and it was recommended in this case. However, the results with the butt joints were so satisfactory that they were adopted.

Standard fittings with inserts of silver brazing alloys can be obtained for pipe sizes up to 10" in diameter or larger and flanges as large as 42" in diameter. The oxy-acetylene torch has been most successful for heating joints of this type and there is every indication that this method of joining piping and fittings will show a large increase in the future.

Household Equipment:

Silver brazing alloys are being used in the manufacture of many different articles used in the home, such as cooking utensils, hot water tanks, water heaters, flat irons, metal furniture and other applications where soft solders do not give the necessary strength and the temperature required for base metal brazing alloys or welding rods would be too high. Fig. 7 shows a copper hot water tank being brazed with a silver brazing alloy which melts at 1300° F. and the heating is done with an oxyacetylene torch.

Other Uses:

Silver brazing alloys are used in considerable quantities for the manufacture of chemical equipment, dairy and creamery equipment and in plants and equipment for the dye industry.

There are innumerable applications in the electrical, automotive and airplane industries where instruments, oil filters, oil coolers, gear shift levers, steering wheel spiders, contact joints, window frames, oil lines and radiator grilles are being brazed with these low melting silver alloys.

There is a suitable silver brazing alloy available for making practically every type of joint on nearly all metals and alloys that melt at temperatures above 1250° F. As engineers become better acquainted with the strong, neat joints that can be made quickly and economically with these alloys, at comparatively low temperatures, their use is being extended rapidly into all industrial fields and they provide an effective means of meeting many of the problems in the manufacture of modern equipment.

The author expresses his appreciation to his associates for their assistance and to Handy and Harman for permission to publish this data; also to the Air Reduction Co., and to Walworth Co., for photographs.

APPENDED LIST OF PAPERS

1. Silver Solders, by Robert H. Leach ASTM —Volume 30, April 2, 1930.
2. "Copper-Nickel (70:30) Alloy," by Mason S. Noyes. Printed in JOURNAL OF THE AMERICAN SOCIETY OF NAVAL ENGINEERS, Vol. XLVIII, No. 1, February, 1936.
3. "The Navy's Soldered Fittings," by Mason S. Noyes. Printed in JOURNAL OF THE AMERICAN SOCIETY OF NAVAL ENGINEERS, Vol. XLVII, No. 1, February, 1935.
4. Instructions for making silver soldered joints and composition soldered fittings —Bureau of Engineering B-172-B-178. Also composition soldered union tube fittings Bureau of Engineering, 3S-525, 3S-526, 3S-527 and B-117.
5. "Silver Soldering by Electricity," by Lieutenant P. H. Ryan, U.S.N.—Reprinted from JOURNAL OF THE AMERICAN SOCIETY OF NAVAL ENGINEERS, Vol. XLVIII, No. 2, May, 1936.
6. "Steam Turbine Materials for High Temperatures," Symposium on Effect of Temperature on the Properties of Metals—Joint meeting American Society of Mechanical Engineers—ASTM—June 23, 1931.
7. "Brazing Tubes in High Pressure Boilers with Silver Alloys," by A. W. Weir and H. M. Webber—American Welding Society Meeting, October 18, 1938.
8. "Incandescent Electric Carbon Silver Brazing," by Walter Reed and Leo Edelson. American Welding Society—February 17, 1938, meeting, Northern New York Section.
9. "Brazing with Silver Solders," by Robert H. Leach, American Welding Society, October 1-5, 1934.
10. "Metals are Brazed in Controlled-Atmosphere Electric Furnaces," by H. M. Webber—reprinted from STEEL, August 12, and 26. 1935.
11. "When and How Silver Solders are Used," by Robert H. Leach—American Welding Society, Cleveland, October, 1936.
12. "Silver Solders and Their Use," by Robert H. Leach—METALS AND ALLOYS, November, 1931.
13. "Silver Brazing Alloys in the Marine Field," by R. H. Leach and Leo Edelson —Journal of the American Society of Naval Engineers, Vol. 51, No. 1—February, 1939.

Presented at the 40th Annual Convention of the International Acetylene Ass'n., Milwaukee, Wis.

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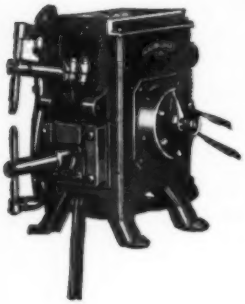

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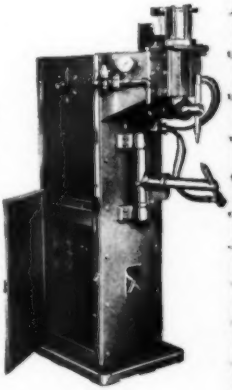

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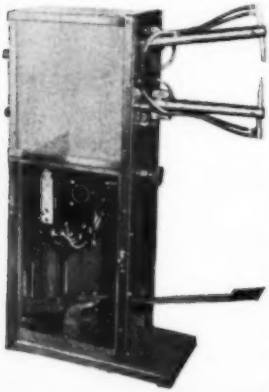

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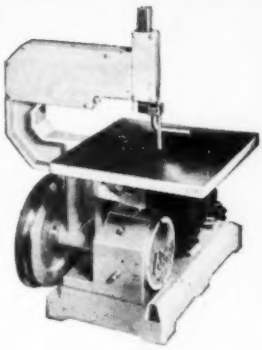

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Fixture Clamping Elements

European Practice and Developments in the Use of Clamping Elements on Jigs and Fixtures

By P. GRODZINSKI, Consulting Engineer

JIGS and fixtures usually are not standard designs as they generally have to be adapted to a special work piece for a special purpose. Considerations with regard to costs, handling time, weight, number of pieces to be clamped simultaneously, etc., are necessary to insure economic design. Trials of standard designs of fixtures until now, have been more successful for small and subordinate parts, whereas usually the design of an economic fixture must be adapted to the special purpose. The shape of the fixture will roughly correspond to the shape and form of the workpiece, whereby precautions for easy insertion and removal must be made. Special parts usually fixed in the fixture body have to be provided to locate and center the workpiece. Other parts fulfill the same purpose with regard to the locating of the fixture in the machine. Further provisions are necessary to insure the safe conduct of the tool with regard to fixture and work piece.

Examples of this include the well known boring bushes and swinging templates for the guiding of shaping or milling tools. However, the chief elements which require a special consideration in each case are the so-called clamping elements. They are, of course, the real active elements and can be compared with the mechanisms acting in a machine. This comparison, not being absolutely true in every respect, can be carried so far, as to say that the clamping elements are the mechanisms of the fixture, in spite of the obvious fact that their action is limited and they serve only for fastening and clamping.

A further help for this more theoretical view is, that it is the trend of today to utilize whenever possible, quick clamping elements which reduce the time for performing the closing and clamping action without interfering with the security of clamping. It may prove advantageous for the tool and fixture designer always to have in mind the various possibilities in the principle, and in the special form in which the clamping elements may be brought, in determining the best way for their use.

Table 1 gives a general survey of the clamping devices with the two main groups clamping by the action of friction and clamping by force. A third group may be mentioned, clamping by adhesion, when utilizing plaster of Paris or cements for fixing workpieces.

This survey shows that in the first group: — Clamping by friction, the greatest number of elements and therefore possibilities are present, allowing the designer the largest number of variations and combinations. All these elements cause, owing to the friction on their characteristic working surfaces a self-locking action, which must resist any outer forces i. e. cutting pressure, weight of workpiece and even vibration. Thus, they provide a safe locking of the workpiece in the fixture. It may be noted that here an effect is utilized, otherwise carefully avoided when designing movable machine parts.

TABLE 1—SURVEY OF CLAMPING PRINCIPLES

General Group	Elements	Remarks
Clamping by Friction	wedge	most primitive element
	screw	not quick acting unless special provisions are made
	cone	suitable for the inner and outer clamping of cylindrical and similar workpieces
	eccentric	most variable element, special quick-acting element
	toggle lever	useful principle, for small differences in size
	springs (metallic or rubber)	sensitive against variation in size
	air-pressure	external supply necessary
	fluid (oil)	external supply necessary
Clamping by Force	pressure	
	electricity	seldom applied
	magnetism	possible owing to new powerful magnet-steels
	electro-magnetism	gaining wider application
	feed-pressure of machine tool	seldom utilized
Clamping by Adhesion	plaster of Paris	
	cements or glue	seldom applicable, and then for small forces
	wax and plasticine	

As shown, these elements can be represented in the various geometrical shapes, as the basic form of which the simple wedge can be traced. The wedge, heretofore, frequently used on fixtures, is now considered as being obsolete and therefore frequently replaced by screws or other elements, being in principle a curved wedge. A more frequent utilization seems to be quite possible as the basic facts for a scientific calculation, according to the special demands, such as clamping pressure and stroke have been given recently. The eccentric can be considered as the most primitive form of a quick acting element, giving an immediate release of the workpiece after a distinct free-stroke, which is covred without any friction being present. This is, however, a special advantage in comparison with other elements, such as wedges, screws, and cones, but it will be shown that these other elements, generally not considered to be "quick acting elements" can be so formed, respectively provided with special devices that they are also in conformity with the quick acting principle.

These remarks especially refer to wedges and screws, whereas the last element of this group is represented by the cone which serves for the internal and external clamping of cylindrical parts. In special cases, link mechanisms are quite suitable as clamping elements. These act on the toggle lever principle, causing a clamping near i. e. before and after the dead-center position. However, the angle and therefore the effective stroke available for clamping workpieces of varying dimensions (the possibility of re-adjustment through screws must be excluded when considering mass-production) is very restricted. But by means of special designs it may be possible to increase the angle between the beginning of clamping and dead center position, so that useful clamping means, according to this principle, may be designed, which according to their special characteristics can also be designated as quick clamping elements.

The spring clamping elements form a special group, as in this case only a distinct and not increasible load is exerted on the workpiece to be machined. The pressure, however, is usually underlying distinct variations, which can only be equalized by means of intermediate levers and adjusting devices.

Magnetic clamping or holding devices represent a new improvement since powerful magnet-steels have been evolved, such as the Alni- and Alnico-magnet steels, which are quite useful for higher working and cutting pressures.

The latest and most up-to-date of clamping elements are those using

NOTE—In the accompanying drawings, workpieces are designated by "w". "lo.p" indicates the locking piece, "cl" the clamping and "lo" the loosening piece.

pneumatic and fluid pressure, in which predetermined pressure is exerted on the workpiece. This avoids distortion, and there exists no relation between clamping pressure and the tolerances of workpiece to be clamped.

Of importance are further clamping devices with a small electric motor which operates a clamping device of high lever ratio. However, these devices hitherto have been applied only for chucking machines.

Further automatic clamping devices have been evolved which correspond to the height position of the working spindle, for instance in a drill press, holding the workpiece clamp and releasing it after the machining operation has been finished. Usually these devices are composed of friction and spring elements.

A number of questions as to the most efficient and most economical designs of clamping devices are not yet solved. During the last decade, though, good progress has been made. Unfortunately these results are seldom reported in technical papers. The intention of this survey is to give some suggestions as to the possibilities which are hidden in the great field of clamping devices. It is the task of the tool and fixture designer to evolve for any special case, the most promising solution, after careful study and after thorough consideration of all influencing factors. In practice, it is seldom that this can be obtained without a compromise.

The most primitive clamping device is the wedge (Fig. 1) which now is generally considered obsolete. That is because an additional operating element is necessary to drive the wedge in and out. This, of course, must be loose, as it must act from different sides. Further the danger exists, that the wedge surfaces may be damaged; that both fixture and work piece may suffer deformation under strong blows. All these effects may reduce the useful life of such a fixture, especially as the

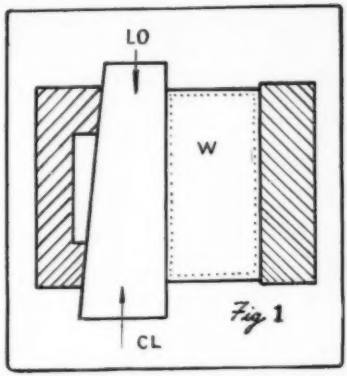


Fig. 1

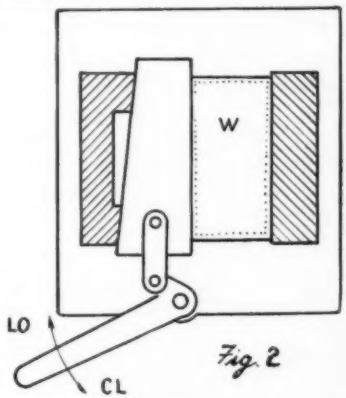


Fig. 2

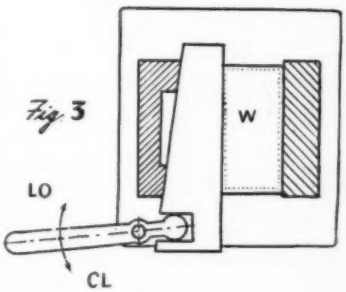


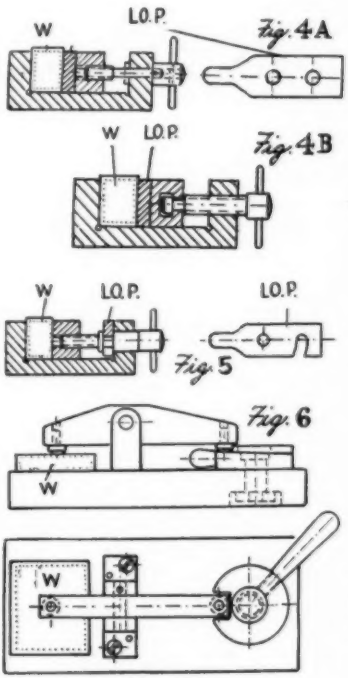
Fig. 3

forces are not under control. If one therefore utilizes the wedge-principle, it is absolutely necessary to provide additional operating levers. In that case, useful and reliable clamping devices may be evolved (Figures 2 and 3). In such cases, excessive clamping pressure is avoided, excluding the possibility that the fixtures may be actuated by a hammer or equipped with a tube for extending the lever arm. The clamping device is actuated by a part embodied in the fixture. If the lever is actuated in one direction, the workpiece is clamped; in the other, it is loosened.

In the fixture, shown in Fig. 2, between the wedge and the swinging lever, a small link is provided. This is eliminated in Fig. 3 by the rounded end of lever engaging directly in a rectangular slot in the wedge. In cases where, during machining, considerable vibration is encountered, for instance when high clamping forces are exerted as in the case of milling and turning fixtures, the high self-locking properties of screws are of value. Usually several full rotations are necessary for the clamping, as well as for the release.

There are a number of ways of changing the simple screw drive into a quick clamping element, as required today. Relatively primitive is the application of C-washer and drop-plates, arranged in front of, or behind the pressing plate Figs. 4a and b). Drop-plates also can be arranged easily at the screw collar (Fig. 5). After the screw pressure has been released, i.e. after ¼ to ½ rotation of the screw, the drop plate can be swung away. The work piece is then free and the screw spindle with the clamping plate can be brought backwards in any desired position.

Besides the usual screw clamps with standard threads, special threads involving only a single helical thread (one cam surface) are used. When utilizing such a design, the single thread has to be interrupted at the lowest position to allow the lifting of the clamping or pressing part from the workpiece. For the quick approach, an inclination of 30° to 45° may be useful, whereas the real clamping range may, of course, be provided with a low inclination angle, usually not exceeding 5° to 6°, corresponding to a friction coefficient of about 0.1.



The combination of screw and wedge sometimes has been very successful. Such combinations are used, for instance, on chucks for turning lathes. An example is the well-known mechanial Forkardt chuck. The basic form of a quick clamping element is the spiral cam, frequently used in the form of an eccentric. This designation, of course, is only applicable for parts which are limited by a circle or a part of a circle. The cylindrical form is

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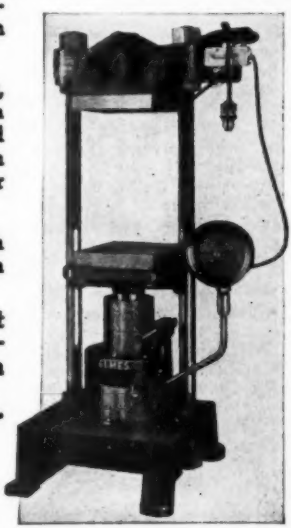

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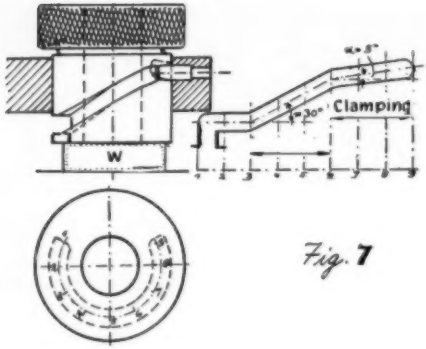


Fig. 7

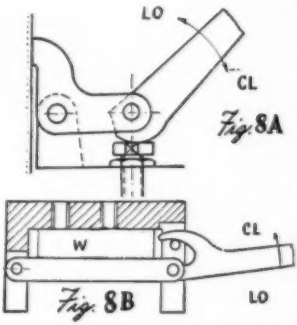


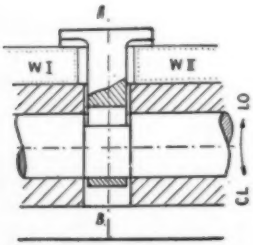
Fig. 8A

Fig. 8B

permissible for clamping ranges of 60° to 90°, i.e. the actuating lever of the eccentric during clamping, should not exceed relative positions under 60° to 90° when clamping workpieces in the permissible range of limits. Otherwise trouble will arise, i.e. in cases where the center point comes in the dead center position and nearly to it. In such cases, a very high pressure is exerted on the workpiece.

One can distinguish between three basic forms of the element, between which great differences exist, not only with regard to their shape, but also as to clamping pressure, allowable height differences, and clamping security. These different forms are:—eccentric (direct acting), hook eccentric and eccentric shaft (Figs. 8a, b and c). The last mentioned design allows the highest pressure to be exerted and gives the highest clamping range (allowable limits of the pieces to be safely clamped.) The hook eccentric is only suitable for relatively small pressures and clamping ranges. The application of this design is therefore almost restricted to drill jigs for the securing of cover plates, etc. The performance of the eccentric (direct acting) according to Fig. 8 is intermediately between that of the elements already mentioned.

The eccentric shaft, Fig. 8, can be manufactured easily on a usual turning



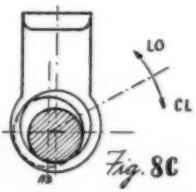


Fig. 8C

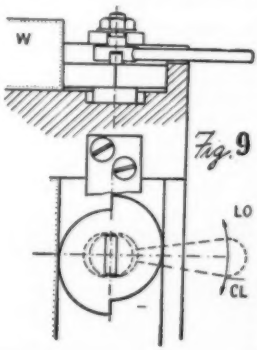


Fig. 9

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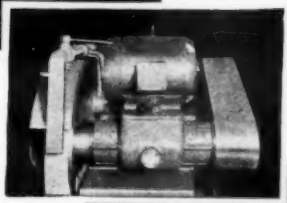

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lathe. For the eccentrics according to Fig. 8, cylindrical discs with a hole eccentrically situated, can be applied, being welded or screwed on rods serving as handles. Further special forms of the elements can be developd, meeting special conditions. This, of course, can be considered as a special advantage of the spiral cam.

As an example of this, in Fig. 9, a spiral cam element is shown, producing the double stroke of a usual eccentric. The eccentric has double cam surfaces, from which one is in contact with a stationary surface, the other being in contact with the workpiece. In this case, however, the axis of the eccentric is caused to perform a sidewise movement, when the eccentric is

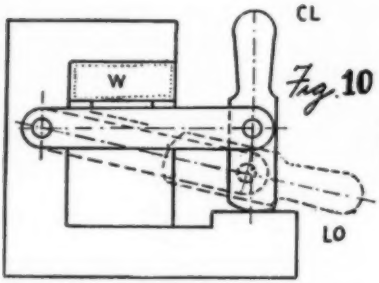

Fig. 10

pressed like a wedge between the fixture body and the work piece. For this case, a longitudinal slot is provided in the fixture body, allowing a sideways movement of the cylindrical hub of the eccentric. The actuating lever is separated from the eccentric and rotatably mounted in a kind of bridge. It fits with a slot in a rectangular projection of the eccentric.

Direct acting eccentrics are usually mounted on a fixed axis, whereas the hook eccentrics are situated on swinging cover plates, etc. These simultaneously serve for the locating of the workpiece and support boring bushes, etc. This method, of course, is not always considered to be a satisfactory one (Fig. 8b). However, similar arrangements can be provided on direct acting eccentrics, of which Fig. 10 is an example. This special fixture is somewhat high, thus reducing its stability, as with regard to a suitable aperture for inserting and removing the workpiece, a special form of eccentric had to be selected. But, also, in this case, the true eccentric form has proved successful.

Fig. 11 represents a clamping device, utilizing members connected by links. This are true mechanisms and they are most frequently utilized for work pieces with small differences in size, almost sheet metal. Clamping mechanisms similar to those shown are in frequent use for the clamping of sheet metal parts of motor car bodies during welding and brazing. The clamping

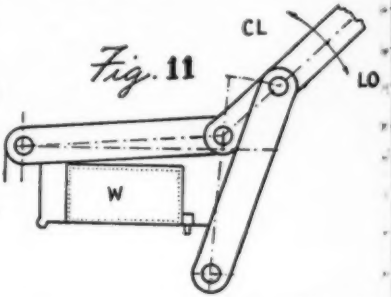

Fig. 11

pressure can become very high with these devices, owing to the toggle lever action.

In cases where the clamping pressure should not exceed a distinct margin, spring clamps have been quite satisfactory. When applying a spring, it is only necessary to provide a device to compress or release the spring pressure on the work piece. In Fig. 12, a fixture is shown in which the spring pressure is generated for the clamping and released for the unclamped position. The spring tension bolt ends in a kind of hook with which a pin on the hand lever engages. When the hand lever is depressed, (as shown) and the lever is brought in the dead center position, the spring obtains the

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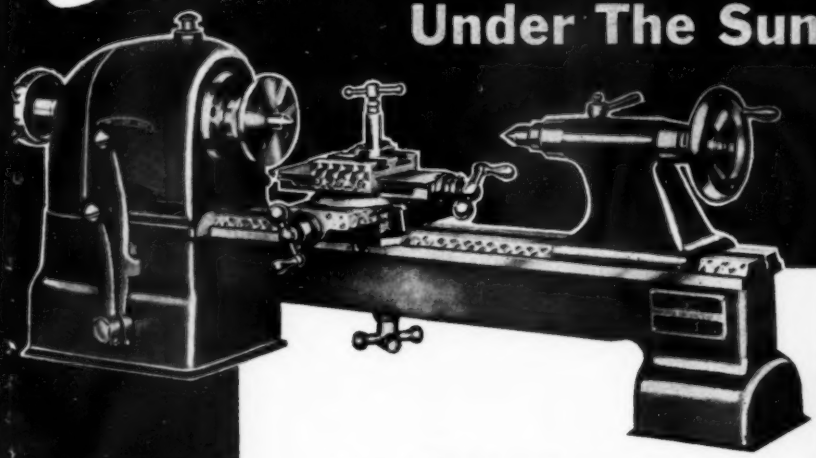

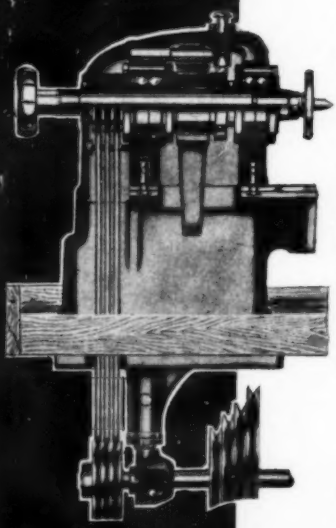

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necessary tension. On more primitive devices, the spring is given free for clamping and is retained under higher pressure when the workpiece is to be exchanged.

Also in connection with the movement of the tool spindle, spring pressure devices are used, thus utilizing a part of the feed pressure to hold the work piece down. In such cases, the spindle of the drill press is connected with a spindle pressing on a spring bolster, combined with the cover plate of the fixture. When the boring tool is fed against the workpiece, the cover is pressed strongly against the workpiece.

Too strong and too rigid clamping may cause eventual deformation of fixture and workpiece. These disadvantages are not encountered with compressed air and oil clamping devices. The workpiece is elastically held, provided the clamping surfaces are properly designed. The complication is that compressors and pumps are necessary to generate the air-or oil-pressure. Simple devices are also known in which the oil-pressure is generated by simple screw drives. In a number of cases, the piston can, owing to its size, not be directly arranged near the clamping point. In such cases, pulling or pushing bars are utilized, as well as bell-crank levers with a distinct lever ratio to exert a higher or lower pressure on the work piece, than is provided by the pressure piston. In distinct cases, the elastic action of the oil or air-bolster is not desired, as the work piece should always be clamped with a distinct pressure, independent of the pressure in the cylinder. In this case, a self-locking device is included, between piston and workpiece. An example, shown in Fig. 14, represents a device in which the pressure can act backward from the piston, on a very reduced scale.

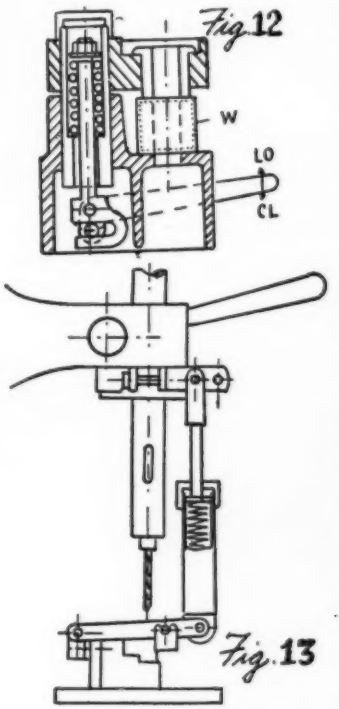

Fig. 12

Fig. 13

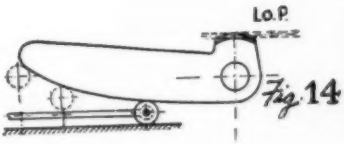

Fig. 14

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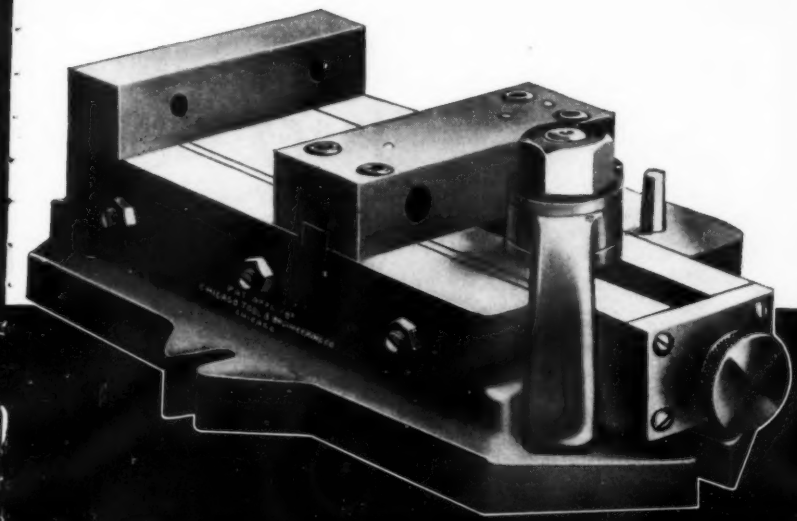

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By CYRIL J. BATH,
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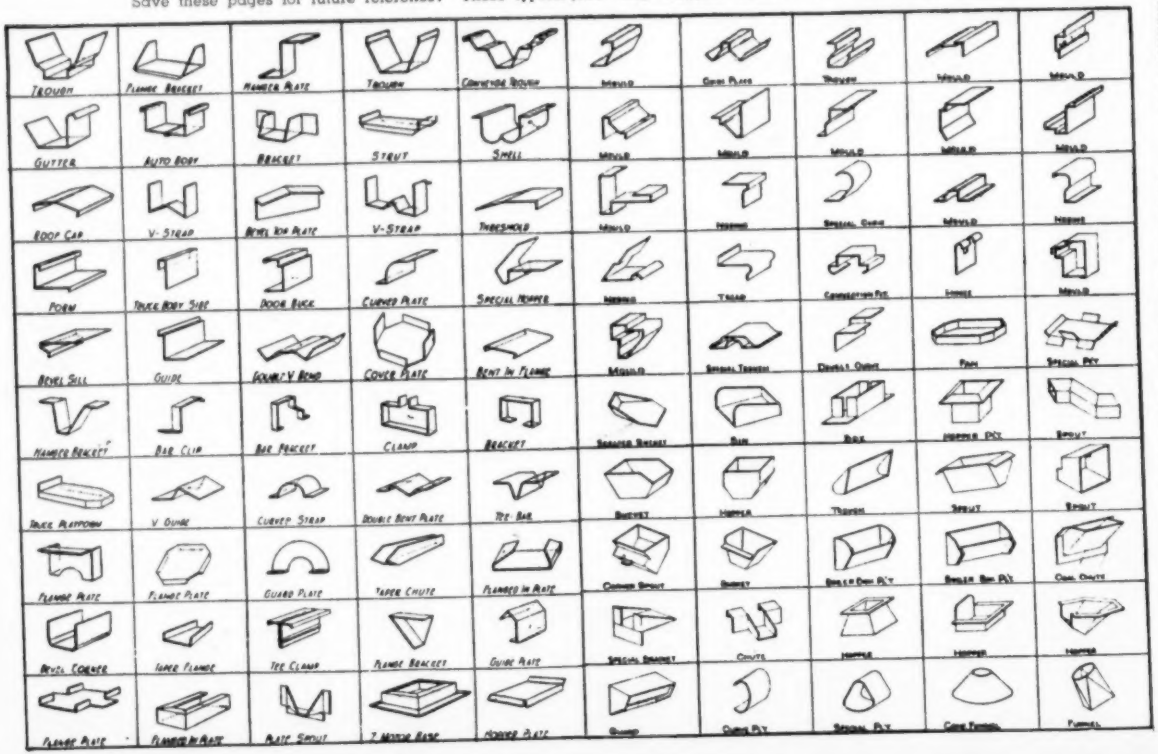
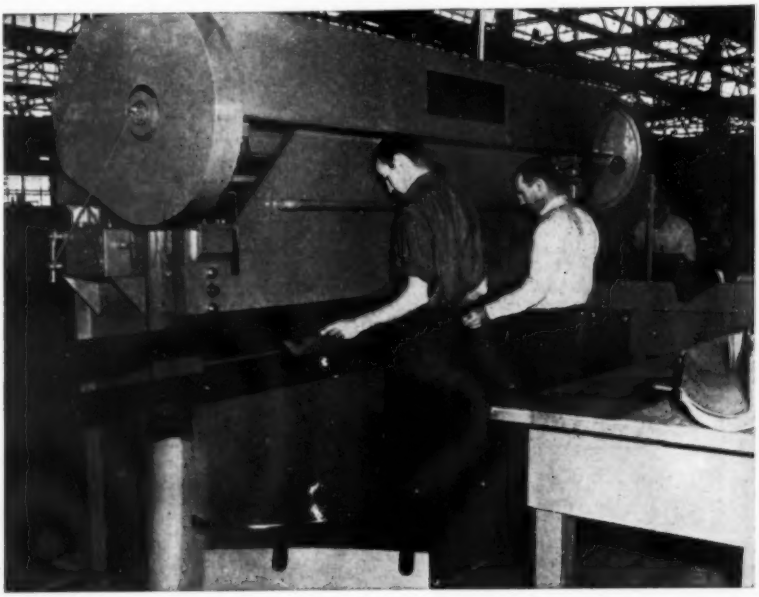
(Left) Special operations with a louvring die, together with samples of the work produced—(Right) A typical forming operation showing details of the dies.

Here are just a few of the innumerable jobs that may be handled on a modern Press Type Bending Brake.

Save these pages for future reference. These typical jobs may suggest solutions of bending problems.





Bending operations at a prominent aircraft plant, forming modulated as well as conventional bends with rubber and steel dies.

principally for the bending and forming of sheet metal, but the modern all-steel bending press, or brake, was not developed until after the war.

Its first usage was also in the working of light sheet metal, but as its possibilities became more apparent, and the art and demands of welding design progressed, mechanical bending presses soon began to appear in sizes large enough to bend 1" plate cold, and to work such plates in lengths up to 30 feet. Such monsters, however, were infrequent, the average shop finding that a shorter tool with a deep throat in the frame through which the work could be passed, was a more practical installation. As an instance of such use, one manufacturer is making stainless steel ship masts for the Navy that are 72' long, having vertical welds. These long bends are made on a press that is only 12' on the die surface. This is done by passing the work through the gap, as in a gap shear.

Very early in their use, manufacturers of truck bodies found that a bending press would bend up a piece of plate, including reinforcements at the edges, into a lighter, stronger and neater body. Stakes and attachment parts and the end panels were then welded in, and the old cumbersome assembly of angles, channels and rivets disappeared in a cloud of high cost. As war preparations became more imperative, the same applications which became sound for truck bodies were generally adapted to armored cars and trucks. Very rapidly, manufacturers who adopted welding found that the bending press would give them all manner of shapes, almost as readily as their designers could cut out cardboard

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and bend it into drafting room models. And they found too, that a bend can have sound structural contours not without their sales value. This streamlined appearance of the new, redesigned bent and welded products looked better, and, most charming of all, it sold better. They found too, that bends cost less than welding, or bolting, or riveting, and this was nothing to lie awake about in a hard world.

Having won a firm foothold in the mechanical industries, it is not surprising to find that there is a wide application in wartime production. First on the list came the plane manufacturers from every country. The bending press was a "natural" for their needs. with its long, narrow bed, its adaptability to forming all manner of shapes, or for punching or blanking, or for multiple operation work. The Navy was among the first to see the uses of bending presses in everything from steel furniture to kitchen fittings, from Diesel engine bases to ship masts and spars. Tank manufacturers found that the modern heavy bending press would perform difficult jobs in straightening and forming armor plate, and the new cargo ships are an excellent illustration of the combined use of the welding process and tools for bending and forming the sections before they are assembled. Most of the designs for gun carriages and anti-aircraft mountings have taken into consideration, similar applications. No manufacturer can hope to point out all the varied uses to which industry is adapting bending presses in war work, but outline drawings like those shown will give a general notion of the wide variety of shapes that can be produced easily and speedily, and shapes of this character enter into a wide variety of war requirements

NOTE—A second article on the use of bending presses will apear in an early issue

Industrial Truck Catalog

Lift jacks and lift jack platform trucks are illustrated and described in the first eight-page section of the new loose leaf catalog of All Steel Welded Truck Corp., Rockford, Ill. Many helpful hints and ideas on material handling problems are given.

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Identifying Cutting Tools

A Simple Marking System Particularly for Carbide Tools Which Assures the Right Grade for the Job

By LEO J. ST. CLAIR

IN ORDER to realize the utmost from cemented carbide tools, it is often necessary to use several different grades. A definite and positive method of tool identification becomes necessary, because it is important to know at all times, just what grade of cemented carbide tip is on the tool. Since there are a number of suppliers of cemented carbides in this country, it is also important to keep track of the tools by manufacturer so as to compare the respective cutting qualities of the carbides supplied. For these reasons, a new and novel method of cutting tool identification has been worked out by the General Tool & Die Corporation, East Orange, N. J.

No Place for Guesswork

During my 14 years of experiences with the engineering development, sale, and application of cemented carbide tools, I have seen countless instances of applications of the wrong grades of tools to jobs, the complete loss of identifications of the grades of carbides and the resulting loss and confusion resulting from such cases.

Poor results obtained due to this loss of grade identification has often discouraged users of carbide tools. Manufacturers of the tools stamp the grades of carbide tips on the sides of the shanks. Sometimes, the stamped sides of the shanks must be ground off so that the shanks will fit into the holders. This results in the loss of grade identifications. Sometimes the shanks are cut off, and again the grade identifications are destroyed. In many cases, the sides of tools become so worn, through long and severe use, that grade identification becomes difficult or impossible, because stamped numbers and letters are no longer deciperable. Users of carbides that make their own tools, often do not stamp or identify the tools. Frequently several grades and brands of carbides are in use in such plants. It is only natural that the wrong grade of carbide is often used, with discouraging results.

When the Worthington Pump & Machinery Corp.'s management decided to use carbides more extensively in 1937, Harry S. Wilcox, their Tool Engineer, decided on a novel method of identification. He decided to paint the shanks of all carbide tools and also to stamp a tool identification number on each. A record was kept of each tool, using the same number on the record as stamped on the tool shank. This record identified the tool as to grade, style, use, and manufacturer of the carbide. Small, circular colored paper discs were used to keep track of the tool in the tool room, in the grinding room and in the shop These discs carried the same numbers that appeared on the tool shanks. The tools were checked out in much the same manner as gauges, cutters, etc.

Shop Records

The paper discs were of various colors. Red was used to indicate that the tool was in the shop. The tool identification number was written on the disc as well as number of the machine on which the tool was being used. White indicated that the tool was sent to the grinding room to be ground. Green indicated that the tool had been sent to the tool room for repairs. These discs were hung on small nails below the spaces assigned for each of the carbide tools.

Before deciding on the type of paint to be used, much experimenting was done with different paints and lacquers. The paint or lacquer used had to resist the action of various cutting oils, and also have the ability of withstanding considerable abuse. Finally, Glidden's quick drying "Lacq" was decided on. A bright red color was used on the Tungsten Carbide group, and a bright green color was used on the Titanium and Tantalum groups of carbides.

Experimental tools were painted blue and streaked with red or green to identify the carbide. These tools were watched carefully by the foreman for he had to turn in a report on their performance. Once accepted, they were painted in the usual way.

Thoroughly Tested

This tool coloring identification system has been in use at the Worthington plant since 1937, and has assured constant, easy, visual identification.

The basic principles of tool identification described, have been used by the General Tool & Die Corp., for the identification of their tools. This system has been worked out so that it will be easy for any plant to adopt it. The system should have general appeal in that the method used insures a simple and easy method of keeping track of all the information necessary in regard to various carbide tools and other alloy tools.

This Company uses two general methods of tool identification: — 1st, color and 2nd, printing Most of the tools have two colors:—one, the main body color; and the other, a secondary end color. The main body color identifies the types of cemented carbides. That is, whether for use on iron, nonferrous material, etc., or for use on steel.

The secondary end color identifies the grade of carbide within each type. All of the grades within the Tungsten Carbide group (for use on iron, nonferrous metals and compositions) are identified by a bright red color as the main body color. All of the grades within the Titanium or Tantulum Carbide group (for use on steel) are identified by a light blue color as the main body color. The secondary end color designates the grade within each group. For instance, a tool with a grade 2A3 tip which is used for heavy duty cuts on iron, would have a red main body color and a white secondary end color, while grade X, used on light and medium cuts on clean steel castings and forgings under .40C would be identified by a light blue main body color and a black secondary end color. The secondary end color covers from 10 to 20% of the total shank surface, depending on the size of the tool. The tabulated chart shows the colors used for the various grades of the "new process" Vascoloy Ramet.

You will notice that the chart gives the Glidden's lacquer number for each color, so that it is easy to adopt this method for plants making their own tools, or for plants buying tools from various manufacturers.

Permanent Identification

As an additional safeguard, two small holes are drilled in the shank of the tool. One is on the side of the shank near the front end, and the other hole is drilled in the end. These holes are from 3/32" to 3/16" in diameter and about 3/32" deep. When the tool is painted, the paint fills up these holes and it becomes next to impossible to lose the identity of the tool even though every trace of paint is worn off the side and end areas of the shank. The hole at the side of the tool will have the same color as the main body color used, while the hole in the end of the tool will have the same color as the secondary end color used. By referring to

the color chart, the identity of the tool is ascertained. The sketch illustrates the use of the holes

This method of tool identification can also be used to reveal the manufacturer of the carbide tip. You will recall that a hole is put into the side of the tool and the end of the tool. If a company were using carbides from three different manufacturers, it would be simple to drill one, two, or three holes at the side and end of the tool. One hole in each place would mean manufacturer "A". Two holes in each place would mean manufacturer "B," and three holes would indicate manufacturer "C." Since the grades of carbide made by each manufacturer correspond to other manufacturer's grades, it is easy to insert the name of other manufacturers on the color chart given. For instance, the "new process" grade 2 A 68 from Vascoloy Ramet, corresponds to Grade 44A of the Carboloy Company, grade HB of the Fifth Sterling Co., and Grade K-65 of the Tungsten Electric Co.

This system of tool identification has met with ready response in the field. It can be adapted easily by firms making their own tools since the Glidden Company's "Lacq" numbers are given on the chart. It can also be used to easily identify the manufacturer of the carbide as already described. The small amount of effort required to operate the system will be balanced by the benefits. It enables a foreman or a supervisor to identify a tool clamped in a machine. If he sees a red shank

Grade	Hardness Rock A	T.R.S.	Nature of Cut	Main Body Color	Secondary Bad Color
2A3	89.3	290,000	Heavy Duty Cuts: 3/32" feed or more on iron. (1/16" feed on bad steel casting.)	Red (2809)	White (2800)
AT	91.0	240,000	Medium Heavy Cuts (up to1/16" feed) on tough alloy irons at comparatively low speeds. (semi-finish cuts on bad steel castings.)	Red (2809)	Yellow (2815)
2A68	91.1	245,000	GENERAL PURPOSE GRADE for Iron and Non-Ferrous Metals. Medium Heavy Cuts (up to 1/16" feed) on pure iron or semi-steel. (light roughing cuts on bad steel castings.)	Red (2809)	None
2A5	92.0	225,000	Light Cuts (up to 1/16" deep & 1/64" feed) on all types of iron. Roughing cuts on low tensile strength non-ferrous alloys and compositions.	Red (2809)	Black (2810)
2A7	92.5	200,000	Light Cuts (up to 1/32" deep & .010" feed) at high speeds on all types of iron, non-ferrous alloys and compositions.	Red (2809)	India Buff (2802)
2A9	92.9	190,000	Very Light Cuts (up to .005" deep & .008" feed) on all types of iron, non-ferrous alloys, and compositions.	Red (2809)	Green (2815)
GRADES FOR STEEL.					
XX	88.4	260,000	Heavy Duty Cuts (up to 3/32" feed) on clean steel castings, and forgings, and on straight Carbon Steel under .40C	Blue (2819)	Yellow (2815)
X	90.0	240,000	Light and Medium Cuts (up to 3/64" feed) on clean steel castings and forgings, and on straight Carbon Steel under .40C	Blue (2819)	Black (2810)
EE	90.5	275,000	Heavy Duty Cuts (up to 1/16" feed) on all alloy steel forgings or shafts, and on straight Carbon Steel above .40C	Blue (2819)	India Buff (2802)
EM	91.2	255,000	GENERAL PURPOSE GRADE for Steel. Light and Medium Cuts (up to 1/32" feed) on all alloy steel forgings or shafts, and on straight Carbon Steel above .40C	Blue (2819)	None
E	92.0	217,000	Finishing and Semi-Finishing Cuts (up to 1/64" feed) on all alloy steel forgings or shafts, and on straight Carbon Steel, above .40C	Blue (2819)	Green (2815)

(for iron, non-ferrous, etc.) being used on a steel job, he immediately knows that a mistake has been made in the choice of grade. Such an error could only be made because the tool room man or operator did not bother to check the grade.

The colored tools look very attractive, and it is believed that this improved appearance will help to insure better care of the tools in the tool room and out on the machines. A tool room shelf is made very attractive when many of the vari-colored tools are visible. A machine tool looks decidedly more attractive with these colored tools in various positions. Machine shops generally, have more or less of a sombre appearance, and without a doubt, the brightly colored tools add life and attractiveness to a shop, and this will be appreciated by many.

STEEL

A Brief Review of the Factors Entering into the Selection and Handling of the Proper Steel for the Job.

By JOHN TISSING,

Vice Pres., Chas. C. Kawin Co., Chicago.

STEEL is an engineering material of wide and extensive application, and a substance of complex and varying composition.

The properties of plain or carbon steel depend, to a considerable extent, on the amount of carbon, and also other elements, it contains, such as silicon, manganese, phosphorus and sulphur.

There are, of course, many grades of carbon steels for special purposes, with more or less unusual ranges of composition; we especially refer to drills, cutting tools, chisels and certain types of springs, etc.

Special Steels

Alloy steel, in addition to containing elements already referred to, contains quantities of elements such as tungsten, molybdenum, chromium, nickel, copper, cobalt, vanadium, titanium, etc.

Steels for special applications often are very complex, containing substantial quantities of many of these elements. There are special types of steels, such as "free cutting steel" with a considerably higher sulphur range; silicon steels carrying a silicon content comparable to that of cast iron; manganese steel containing over 10% manganese, also heat and corrosion resisting steels. These and others find special application in many fields today.

Aircraft calls for extra quality steels, used in the production of engine parts, requiring lowest possible weight per horse power, with the greatest possible degree of reliability. Such steel must be of high quality, maximum uniformity, and one which responds very favorably to a high degree in the matter of heat treatment.

Steel is also classified in a general way as to its mode of manufacture, Bessemer steel is made in a Bessemer converter. Electric steel comes from the electric furnace. Open hearth, both "basic" and "acid," is made in open hearth furnaces, and in the case of Crucible steel, a Crucible is used.

The original raw material from which commercial steel is derived is iron ore. This is an oxide of iron, contaminated with many mineral impurities. The principal ore is hematite, but there are others such as limonite, magnetite, etc. Most of the iron ore used in this country comes from the Lake Superior District.

Grade Selection

It is obvious that in selecting steel for any given purpose, the requirements to be met, and conditions under which it is to be used, must be considered carefully, as each of the elements, intended or impurities, reflects on the properties and quality of the steel, subject to modifications and improvements possible by proper and carefully controlled heat treatment.

There are today, many standard specifications issued by different organizations, such as A. S. T. M., S. A. E., etc., which are quite dependable. In many cases, though, it is best to supplement these by experience as to past performance in deciding upon any steel for any given purpose.

In addition to prescribing correct composition for any specific purpose,

one of the most important details in steel handling, for proper conformance with "actual physical" specification requirements, is that of heat treatment. This treatment, stated in general terms, is a controlled process of applying heat within closely controlled limits as to rates of heating to certain definite elevated temperature, and rates of cooling. This cooling is effected by making use of various cooling and quenching mediums, such as water which generally is most convenient.

The quenching rate of this medium, of course, drops with a rise in temperature, possibly due to the so-called vapor blanket formed, preventing effective dissipation. There are other mediums which are intended to nullify this effect and are therefore more efficient.

Oil Quenching

Oils used for quenching, generally have a considerably lower cooling rate than water, but produce less distortion and therefore are often used in cases of complicated shapes, especially of high alloy content. For this purpose, mineral oils of "high flash" are effective, as they are generally more stable than other oils, as well as less costly.

However, regardless of the quenching medium used, it is obvious that to a considerable degree, quenching strains are possible and must be relieved; otherwise, cracking may occur. The operation to relieve these strains is referred to as the "drawing."

It would be out of place, in an article of this kind, to delve deeply into the more technical side of these matters, such as micro-structure, etc., but upon etching a piece of highly polished steel surface, the structure becomes more apparent. This etching is done by certain mediums—acids, etc.,—which effect the various elements in a differing manner, causing them to assume color or structure peculiar to themselves. Certain specific names have been given to these microscopical constituents, such as "Ferrite" which is a carbonless iron, while in the case of "iron-carbide," the term "Cementite" is used.

When these two constituents arrange themselves in a certain order, they are termed Pearlite or Sorbite, the former laminar—i. e., cementite and ferrite plates arrange themselves side by side—while the latter has more of a rosette form as its characteristic.

Like many substances, Pearlite, Ferrite etc., are decomposed by the action of heat, and new combinations formed each having properties differing materially in character, very much like the case of common water which can assume, by reason of temperature, three different forms:—i. e., "solid" (such as ice), "liquid" and "steam."

Pearlite and Ferrite remain as such up to a temperature of approximately 1500° F., depending to some extent on quantity, after which they decompose or change, forming new and entirely different constituents, such as "Martensite" which differs greatly in properties.

This Martensitic structure can be preserved by cooling suddenly, as by quenching, already referred to. Martensite is very hard and brittle, while Ferrite and Pearlite are soft and more or less tough.

Heat Treating

There is very close relation between the treatment and structure of steel and the physical properties. Therefore it is important to tie this in properly with temperature elevation in relation to what is usually termed "critical points," as that is fundamental in heat treatment. This elevation or degree of temperature should not be construed with the manner of working a steel in its fabrication, as also in this case, the physicals, and, to some extent, the structure are dependent on the manner of mechanical working.

Usually steel in this connection is classified under two separate heads, i. e., "hot" or "cold" working, or when cast into molds representing finished forms it is known as cast steel. Then again, the "grain size," whether this be fine or coarse, or changed, depends to a great extent on the manner in which steel is handled under elevated

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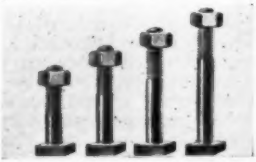

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TOOLS for the TOOLROOM

temperatures, particularly with regard to critical range or ranges, at which point coarse crystals break up forming finer ones, depending on handling methods, etc.

Since all crystallization in structure is obliterated in carrying steel through the critical range, it is necessary to heat steel through this range as an initial procedure of annealing, as heating to a temperature below the critical range would cause no change in structure. Should it be carried considerably above that range, an undesirable form of crystallization may occur.

The purpose of annealing is to increase softness and ductility, and to facilitate machining operations. It also removes coarseness of grain, thereby producing a desirable combination of strength, elasticity and ductility. Further annealing relieves internal stresses, often held over from fabricating operations. It is therefore, very obvious that in all these operations intended to effect properties satisfactorily, close control as to temperature, degree of temperature, length of time steel is held at these temperatures (which also depend on size and thickness) are very important, and that ultimate strength of steel depends on many factors in addition to composition of the steel itself.

Grain Normalizing

Grain size has an important bearing on physical properties. Generally the finer the grain the better the physical properties. Therefore, much of the treatment of Pearlitic steel is directed to obtaining this fine grain "normalizing."

In the case of hardened steel—Martensite—the grain structure is also important. While the steel may be hardened by quenching from any temperature above the critical range, excessively high temperatures, as stated, lead to poor properties. This causes large grain size, as size of grain is largely determined by rapidity of cooling through the freezing range.

Carburizing steel is defined as the act of producing a higher carbon steel from a homogeneous lower carbon raw material. The explanation of this treatment is to place a high carbon case or surface on a low carbon steel, usually one with a carbon content of .15 to .125. The steel is packed in boxes and carburized by absorption of carbon from highly carbonaceous solid materials. Soft steels are usually cased deeply, and high carbon steels more superficially. This is controlled by heating time, temperature, or carburizing agents

Where greater stiffness of core is desired, higher carbon steel is used, but the higher the carbon in the raw stock, usually the more difficult will be the introduction of carbon below the melting range.

Case Hardening

Carburizing packing materials or cements vary, particularly with regard to energizing material contained therein. Usually those are used which have been found best for the purpose, or any particular class of work, mostly solids, for objects such as dies, gears, steering knuckles, bolts, etc. The work is usually carburized all over the surface, or small sections may be protected suitably by various expedients (such as copper plating) to limit the carburizing to the required areas.

In protecting and controlling the performance of steel parts, careful chemical analysis of materials is provided for and checked against specifications under which stock was purchased, and, as a further precaution, physical tests are made.

The most common of these is the tensile test, which is a measure of resistance to being pulled apart, by carefully and steadily applied load. By this same test, the elastic limit is obtained, which measures elasticity or ability of the body to regain its original shape after having been distorted. Also, the total lengthening of the specimen under test is known as elongation and usually expressed in percentage of original length. This elongation causes a corresponding decrease in cross-sectional area and is referred to as "reduction in area," also expressed in per-

centage of original cross-sectional area.

Toughness is the opposite of brittleness and is measured by reduction of area. Usually a great elongation area and great reduction of area go together, so that a steel may possess both a high degree of ductility and toughness, but there may be a decided reduction of area without a corresponding elongation. Brittle materials show little elongation and reduction of area as, for instance, high carbon steel.

Brinell hardness is the number obtained, or ratio between load applied on, and the spherical area of the impression made by a steel ball forced into the surface of the steel under a 3000 kilogram (6600 lb.) load.

The compression test is a measure of resistance to the steel specimen being crushed. Shearing strength is the resistance to the steel being sheared or cut. Torsional strength is the resistance steel offers to being ruptured by twisting.

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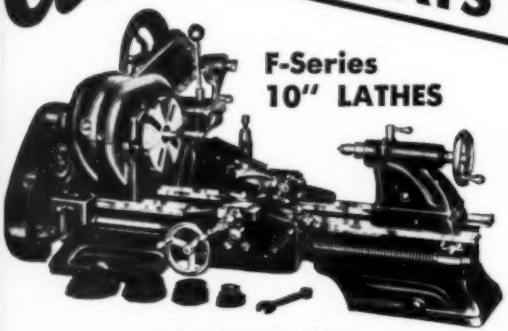

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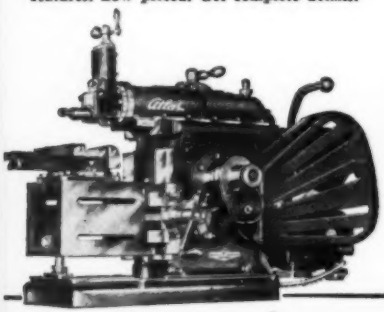

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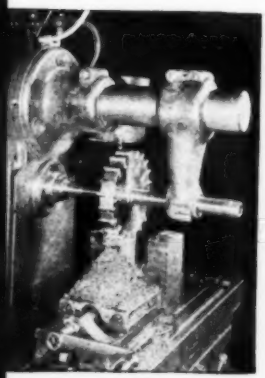
Cutting the Cost of Cuts

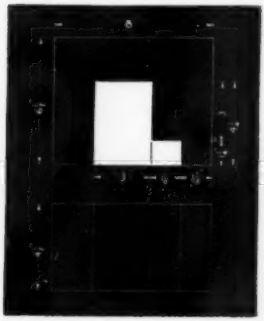
Part II—Further Examples of Contour Sawing Contrasted with Stock Removal by Other Means

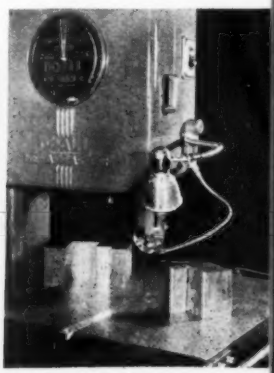
By H. J. CHAMBERLAND

Sawing-Milling Teamwork

MILLING operations may be classed under three major groups with so-called plain cutters, formed cutters, or a gang made up of both types with possible addition of one or two inserted teeth mills. From a quantity point of view and to obtain an outline, when the amount of stock to be removed is within reason, this is a privilege you can't take away from a milling machine. If it could be done, there would be a more limited field for heavy type universal millers. We need milling machines to generate spiral cuts, whether one or a thousand parts are involved. There are also precision spacings to be had for various purposes, so these and other reasons lead us to believe that the milling procedure is here to stay. The point is, why continue in many cases to waste material and time when this could be avoided by getting around to it the right way? The contour sawing machine is the solution to this problem, since it can quickly remove excess material in slug-form. This procedure will materially increase the efficiency of a milling machine because feed and speed can be increased as there is but little material to be removed to finish the cut. It is also true that cutters will go much longer between grinds as they are not forced to "hog." This means longer tool life and less break-and-set-ups. It is certainly not 1940 economy to pile up a load of chips by milling as in Figure 19, a substantial number of parts to obtain the cut shown in Figure 20. The contour saw here would be the thing even for continuous production, as the parts could be finished-milled in multiples at a high rate of production, by making a clamping fix-







Figures 19 and 20—Why "gyp" the miller with chips when you can save time, cutters and the slug by sawing?

ture and using a two-cutter gang.

On the other hand, contour sawing in relation to small-lot production would no doubt give a milling machine idle hours unless there were sufficient fitting jobs to prevent it. When the nature of the work is within the capacity of the contour saw and quantity does not warrant the investment of expensive tooling, the contour saw is the way out, even though an extra allowance has to be made in the size of the blank to navigate a certain circle. Contour sawing can, in most cases, eliminate the fly-tool, special milling fixtures, and excessive filing to finish outlines only partly completed by sectional milling. To this we can add the practice of depreciating many a good milling cutter or cutters to obtain a

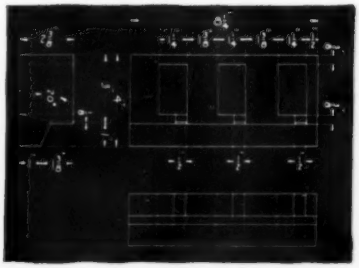
Fig. 21—The Contour Sawing machine cuts any shape inside and out, with an eighty-cent tool.

certain outline or come as close to the measurements as possible. Shown in Figure 22 is one of the jobs that helped put contour sawing in the front—almost a week's work by former methods but done in three hours by contour sawing, plus the saving of considerable material.

Some parts used for replacements, to make improvements, or for experimental purposes are very often, not only intricate, but costly to produce. Such a part is shown in Figure 23 and note that its fabrication involves three dimensions. Contour sawing easily cut out the part, left, from the solid block and layout, right. A day's work done at lunch-time speed.

Broaching vs. Sawing

Broaching always has been one of our most indispensable tools. It has saved thousands of dollars in the precision finishing of irregularly shaped holes. Broaching is the sole quantity production method, whereby precision



and uniformity of cut can be maintained and still hold production at its maximum rate. The broach takes on where the drill and boring tool leave off, and as effecting the average requirements it is a combination semi-finish and finishing agent. Contrary to a rose reamer, plain reamer or boring tool, which remove an equal amount of metal on its gradual path through an opening, the broach produces the desired outline by step-cutting procedure, whereby and starting with the first cutting edge, the conventional hole is gradually rough-shaped until the last two or three edges produce the desired internal shape, size and finish.

In recent years the broach has superseded the reamer and precision boring equipment in numerous cases. This is due to the fact that the procedure is highly productive, when quantity permits, removing a limited amount of stock evenly distributed. The broaching machine has the advantage in this case since the ram can carry a down-

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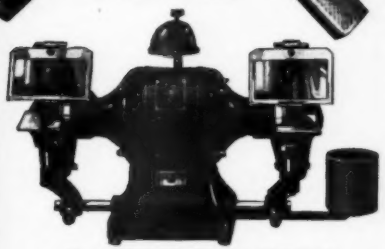

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"COST LESS PER YEAR"

ward stroke of 30 feet per minute, more or less depending on the nature of work.

The fact remains that until the introduction of contour sawing, it was deemed necessary to make a broach even when very few parts had to be so machined. It is not unusual when the cost of hand or jig-filing a complicated internal outline will equal that of making a broach. A broach needn't be very fancy to be placed in the formed cutter category. The broach is another tool with which the return stroke pays no dividends, in spite of the fact that the ram comes back usually twice as fast as it goes down. The broach gets a severe set-back because, like a threading tool, the cutting edges are very delicate—so tender-hearted, in fact, that it hurts them as much to come back up as when they actually cut coming down. If a broach could be so made as to act as a collapsing tap, it would relieve broaching experts of much concern.

Therefore, contour sawing is free from any of these inconveniences. The more complicated the problem, the more money saved by contour sawing. In this case, as with other comparative methods already considered, the contour saw has its limitations, but it can certainly take on enough jobs to help pay for those not within its range. I couldn't bring out a more convincing example of contour sawing in this respect than the part shown in Figure 21. The requirements here were for but a single piece, but just imagine cutting out slugs of the dimensions shown at the rate of time consumed per cut. While consideration must be given to the extra time for drilling the 9 holes, "how else and at what cost could a job like this one be done except by contour sawing?" Couldn't some similar design, involving a number of parts be similarly produced in one piece and then cut off to suit, thus making the procedure still more economical for short-run production?

Band Filing

The longest way home is said to be the sweetest, but when you consider filing, band filing is the sweetest for the operator as well as the most economical for the one who pays off. What makes a machine tool a gilt-edge investment is when it has such flexibility, that without bending it out of shape, you can readily convert it to a different phase of production, at no extra cost. This is something one can do with contour sawing equipment. Cut, file and even polish if the drawing calls for it. Any of these operations can be performed and require about one minute change-time. It is not only a question of filing or polishing what is actually contour-cut, but the advantage of band-filing or polishing any part regardless of how it was cut.

There is no waste of material in band filing that already has been cut on the contour saw. Otherwise, it all depends on the method of cutting. One thing is sure and that is, the band file is five times faster than the jig-file and 10 or more times faster than laborious manual filing. Recent tests made with the three methods, on tool steel and using in each case a ½" wide and 16-teeth file, have produced, respectively and in one hour's time, 2 ounces of filings by hand power, 4 ounces with the jig-file and 19 ounces with the band file.

The return strokes are even more disastrous to the jig-file than they are to a hack saw. This is the reason a jig-file has a short life, and so does the hand file used by inexperienced workmen. Obviously, band files are not of similar construction to the band saws. A band file assembly consists of a high grade steel band to which file segments are securely and quickly attached in such a way as to eliminate "bumping" action. The band is not cut and welded for internal filing, as has to be done with a band saw. It is designed to be readily unhooked and rejoined. The mechanical laws applicable to band saws apply to band files. The material and shape of cut governs the width and style of band file to use. The speed must be regulated accordingly and the pressure used determines the cutting action and finish.

Band polishing on a contour machine does, however, require a special attach-

ment in the form of a rigid back-up support, having a graphite impregnated facing. The bands, although limited to 1" width, are similar to those used in shop band filing practice. A coarse grit abrasive band in connection with the contour saw, gives it remarkable stock - removing properties. A correctly selected fine grade abrasive will produce a mirror-like finish.

Cutting Off

If we disregard the word "contour" for the present and fit the machine with the proper saw, we have a real cut-off machine. This piece of equipment is, of course, too good for one to turn it into a continuous cut-off machine as it has more important duties to perform. Recently designed, heavy-type power hack saw machines are adapted to stack-cutting and this idea has substantially increased their productivity, and it is best we let the power hack saw attend to its business.

What I'm getting at is the competition that the abrasive cut-off wheel is giving both the band saw and hack saw procedures. From a general point of view, I would not dare attempt to make any direct comparison between the cut-off wheel and any other cutting equipment. It is a well established fact that, in relation to day-after-day cutting, the cut-off wheel has an imposing lead, depending on the nature of the material and size. But the fact remains that over-all costs are rated only half those of the saw.

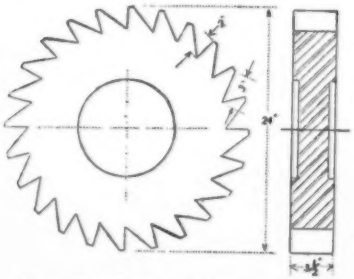


Fig. 22 — Former production time, 40 hours—contour sawed in 3-hours.

However, we must bear in mind that this is on the basis of mixed and continuous production and not classed material and short-run production. The cut-off wheel seems to attain its highest efficiency with soft materials and soft metals such as brass, bronze, aluminum and appears to retain high cutting relations to carbon tool steel. Since the problems of the average tool room and production floor involve tougher ferrous materials than ever before, I think we have something in the contour saw. For example, a 12" x 3/32" or 1/8" cut-off wheel must be supported on both sides by 4" collars, thus limiting the depth of cut to 4" with a new wheel. Every material requires a wheel of different analysis. A

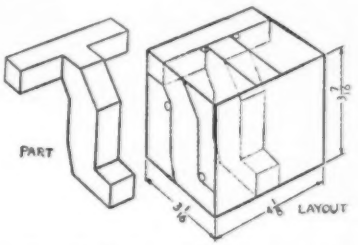
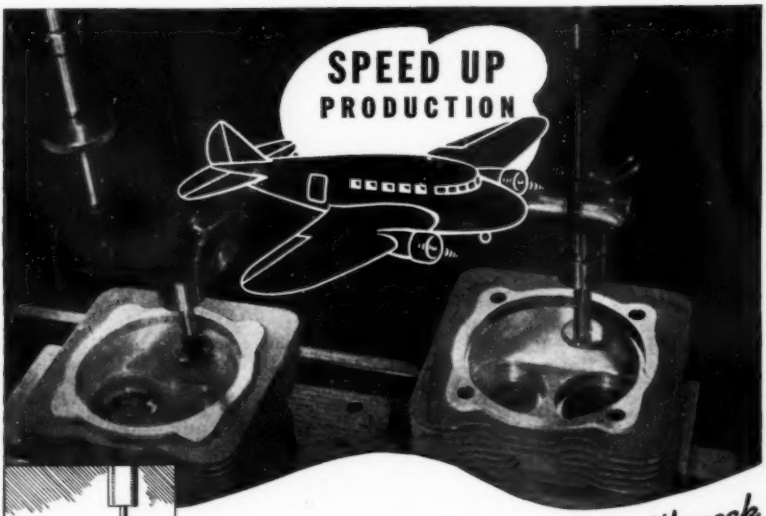


Fig. 23—A three dimension cut, that required 9-hours by former methods—contour sawed in 27 minutes.

wheel that will produce 700 cuts on carbon tool steel may produce less than 200 on high-speed steel and considerably less on several other tougher alloys. The cost of the wheel is twice that of a high grade band saw and the risk of wheel breakage is much in favor of the saw. While the cut-off wheel gives a square and clean cut, the width of cut is double that of the saw kerf. It is well to state here that the wheel has one marked advantage over the saw, which is its ability to cut hardened steels. This, however, represents but a slight percentage of cut-off requirements. If we assemble the facts and consider the low saw investment, the 1-3/8" per minute C.R.S. cutting capacity of the saw and chiefly the possibility to stack-cut, which can't



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be done with the wheel, by making some simple holding device, I assume that we can produce 1000 assorted cuts more economically with the contour sawing machine than with a cut-off machine which can't do anything but that.

Welded Steel Construction

In concluding this resume of contour sawing procedure, it would hardly be fair not to include a brief outline of the economy resulting from the contour saw in preparing components for welding. In recent times, welded steel construction is a much discussed subject, the outcome of so many new alloys being introduced which provide added strength and reduced weight. To maintain strength and rigidity and still decrease weight has always been a basic principle of the art of welding. This now brings back the question as to which is best—sticking to castings or welding the job.

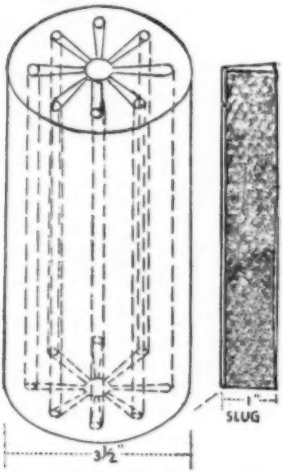

Fig. 24—Contour sawing is the only way this job can be done. The 8 slugs were cut out in 10 hours 40 minutes.

In connection with this particular subject, the torch again has the advantage for cutting heavy components going into the fabrication of bulky equipment. When it comes to making jigs, fixtures and other items of a lighter type, there is no better and cheaper way to put the parts in trim than to saw them on the contour machine. Whether the arc or acetylene process is used, matters not in this case. We are merely interested in economy and efficiency at their maximum, preparing the components to be welded so they will bring out an attractive as well as a strong unit. The contour saw is the best bet to guarantee that the parts will have their required accuracy and quality of cut which will cause the welded job to look as though it were die cast. One of the major advantages of welded construction is the possible use of odds and ends and I don't mean scrap. The contour saw produces these odds and ends which would otherwise be reduced to chips, so one way to look at it is that material required to make many jigs, fixtures and the like wouldn't cost anything.

Chief Factors Governing Contour Sawing Technique

1—For maximum economy, use widest saw possible which is determined by the size of drilled hole or holes fitting the requirements of the cut. The saw may well act as a file for notching to obtain sharp corners.

2—Select a tooth construction that will provide at least two teeth contacting the work.

3—Use coarsest saw set possible for maximum chip clearance and minimum friction.

4—Generally speaking, the thinner the material the more teeth per inch required on the saw.

5—Blade tension is governed by width, the narrower the blade the less tension required, this part of it is best mastered by practice.

6—Use an even and common-sense pressure while cutting and slow up to navigate small radii.

7—Modern metal-cutting band saws are available in 8 widths, from $\frac{1}{4}$" to $\frac{1}{2}$". There are 3 types, namely, raker tooth, wave tooth and straight tooth.

8—There are 2 thicknesses of set, light and heavy. There are 3 tempers, A, B, C, respectively meaning very hard, hard and medium hard.

9—Practice makes one an artist in any line of work and contour sawing is no exception. While the width of the saw usually determines the minimum radii possible, the operator will gradually find himself able to work from a standard high to a possible low.

10 — Before starting, check and double-check to ascertain you have the correct saw and speed for that particular job.

Note:—A job selector dial and speed indicator gives recommendations for requirements in connection with 45 different materials.

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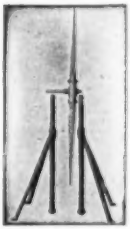

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Welding Reduces Costs

Typical Examples Showing Advantages Recently Realized with Arc Welding in Fabrication

By FRANCIS A. WESTBROOK

THE Multi-Hydromatic Welding & Mfg. Co., Detroit, Mich., consumed only seven days' working time to advance the production of the large machine frames from the status shown in Fig. 1 to that shown in Fig. 2. If conventional construction had been used, this manufacturer reports that several weeks would have been required for pattern making alone. The frames are for large hydromatic welders, and their fabrication is accomplished with two arc welding machines.

In these days when so many more charges are fixed than formerly, and cannot be cut, any manufacturing costs which can be reduced are of correspondingly greater importance. Arc welding, as an instrument of fabrication is often a very convenient and simple means of cutting costs which is far from having reached any where near its ultimate development. Welding is fast; intermediate, connecting members can be eliminated; weight is reduced to a minimum; strength is adequate; quality is improved and the equipment needed is not expensive in comparison to the savings made possible. The operation is direct and as a usual thing, numerous steps in production can be eliminated.

Here are some more recent examples of savings made by progressive manufacturers in an effort to offset rising fixed charges.

The Wallace Supplies Mfg. Co., Chicago, report that they have reduced

Figures 1 and 2—At the left is shown the prepared material, and at the right, the frames for large hydromatic welders, completed by two welders in seven working days.

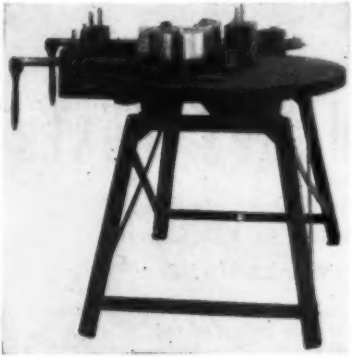

Fig. 3—Bending machine constructed of cast and riveted components.

the cost nearly 50% and improved the appearance of the rack top plate of a bending machine by a welded design. The latter is shown in Fig. 4 and cost $32.00, as compared with $60.00 in cast construction, as shown in Fig. 3. The arc welded bender weighs only 736 lbs. and can be operated by one man, whereas the cast bender weighed 1250 lbs. and required two men for operation. Added to these advantages, the appearance was greatly improved as is evident from the illustrations. Thus the manufacturer reduced his own costs and at the same time provided an improved product for his customers, which undoubtedly helped to reduce sales resistance.

Fig. 5 shows a mining locomotive bumper which is now fabricated by the Goodman Mfg. Co., Chicago, from rolled steel plate, flame-cut, formed in a hydraulic press and arc welded. This method supersedes construction of cast iron at a cost saving of some 40%.

Evidence that arc welded construction is economical in fabricating small

Fig. 4—Modernized design of bender with arc welded parts.

parts is provided by the work shown in Fig. 6, also made by Goodman. From left to right, these are:—a flight for a

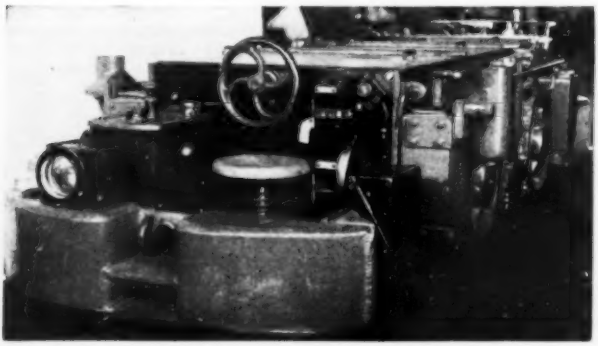

Fig. 5—Mining locomotive with welded bumper. Parts for this were flame-cut from rolled steel plate, hydraulically formed and arc welded.

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"Buffalo" RPMster DRILL

Fig. 6 — Small parts fabricated by arc welding at a material saving in cost and weight.

conveyor, a bracket for a clutch hoist, an adapter for a locomotive bumper (in background), a brake hanger support for a mining locomotive and a slabbing machine lever. These parts, formerly made of cast construction, are now produced by arc welding at a reported saving of 35% in cost and 40% in weight.

Arc welded steel reduced the cost of the 3-legged stand for the potato peeler made by G. S. Blakslee Co., Chicago, from $28.70 to $12.64. The former cast iron construction is shown in Fig. 7 and the modernized form in Fig. 8. The quality of this product was also much improved as the cast iron type broke occasionally in service. Arc welded steel made the stand unbreakable and in addition, permitted production of this unit at any desired height without any additional charge for patterns, thus making it a simple matter to cater to customers' individual needs and assisting the Sales Dept.

The simplicity of arc welded construction is well illustrated by the two booms for a power shovel shown in Fig. 8. The welded boom in the foreground was produced by two men—a welding operator and a fitup man. The riveted boom in the background required five men for its fabrication. The welded boom is also 400 lbs. lighter, while possessing greater strength and rigidity. The saving realized by Bay City Shovels, Inc., Bay City, Mich., the manufacturer of this item, is apparent.

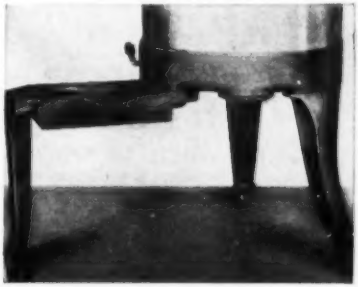

Fig. 7—Potato peeler of former design with cast components.

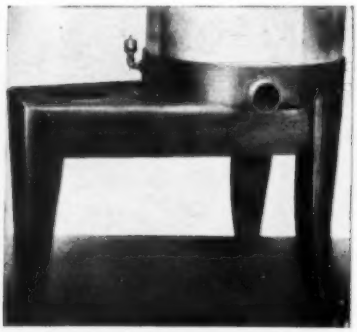

Fig. 8—The modernized version with streamlined arc welded parts.

Many additional examples of recent developments in arc welding applications could be cited, whereby savings and improvements in products have

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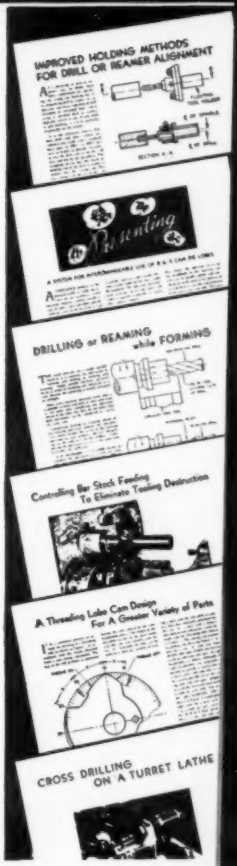

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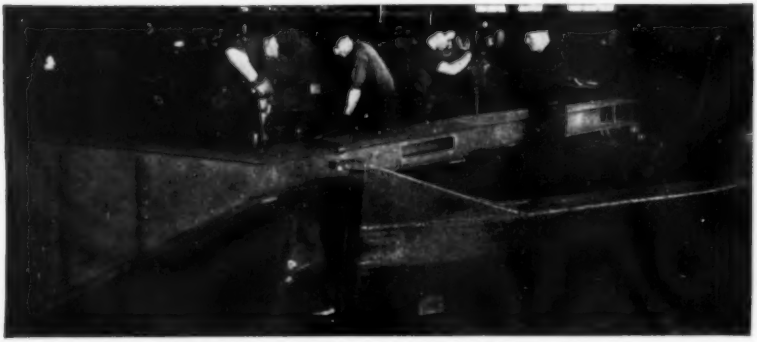

Fig. 8—Welded power shovel boom in the foreground was produced by two men while the riveted boom in the background required five men for its fabrication.

been realized. However, enough have been given to show that industrial executives will do well to look into this very simple method of cutting costs in a wide range of products. Welding will help speed the national armament program.

(Photos, courtesy Lincoln Electric Co., Cleveland.)

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BOICE-CRANE COMPANY 1729 NORWOOD AVE. TOLEDO, OHIO

Extruding "Stainless"

New Extrusion Press Permits Extrusion of Stainless Steel, Ferrous and Non-Ferrous Tubing and Rods

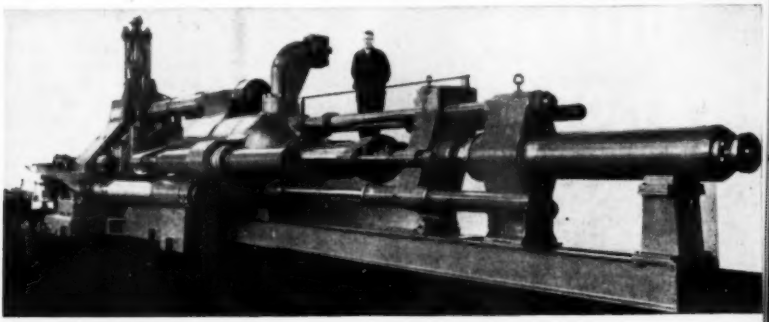
WHILE the extrusion of non-ferrous metals has been performed for some 35 years, it is only during the past several years that the extrusion process has been successfully employed for the production of stainless steel, nickel alloy and ferrous rods, tubing and shapes. This advance, which appears likely to open new fields for special alloys, has been made possible by the development of the hydraulic extrusion press. A press of this type, of 2000-tons capacity, built by Farrel-Birmingham Co., Inc., Ansonia, Conn., is shown.

The designers believe that with this new press, all of the currently known stainless steels and other special ferrous and non-ferrous alloys, which do not work well by rolling, welding or piercing, can be extruded without difficulty.

It is probably correct to say that any article extruded from a billet, acquires a grain structure more free from faults than if it had been rolled. This change in structure is due to the fact that extrusion is a squeezing-compression process, while rolling and drawing is a stretching operation. There are special alloys which cannot be rolled without developing serious inherent faults, rendering them unfit for certain commercial purposes.

Another advantage given is that extruded tubes of stainless steel, for instance, can be more easily drawn down to smaller sizes than tubes manufactured by any other process. This means that a larger reduction can be obtained from extruded tubes than from tubes made on a piercing mill. For example, it is said to be possible to draw down extruded tubes to a final dimension of a few thousandths of an inch in diameter, for hypodermic needles, the final tubes having a perfect structure.

Aluminum alloys are extruded in numerous semi-finished shapes which are readily worked into final dimensions.



The billets to be extruded can be taken as rough cast billets coming from the foundry after being cut to the proper length. The skin of the billets, which is formed mostly by oxidation, remains as a thin shell in the container after extrusion, so the extruded product is formed of clean material only.

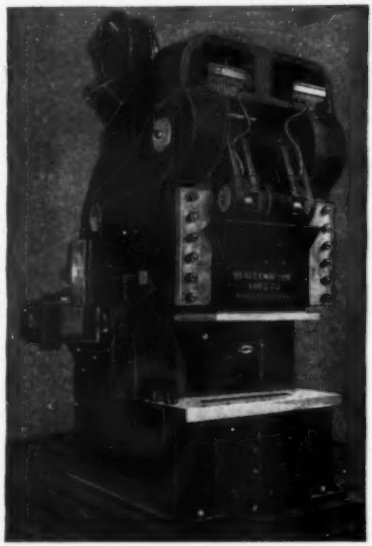
It is asserted that tubes and rods manufactured by this press are not only remarkably sound in structure but possess excellent metallurgical and physical properties and a good condition of surface. Consequently the number of draws for finishing can be considerably reduced.

The amount of scrap-consisting of the thin shell of the billet and the discard —is claimed to be very low, so the difference in weight of the billets charged into the container and of the extruded product is only about 8% to 10% in the case of tubes, and about 10% to 12% when manufacturing rods. The concentricity of the extruded tubes is well within commercial limits, and provided that sound billets, uniformly heated, are extruded, it is said to be within plus or minus 5% of the wall thickness. Compare with this the tolerance in wall thickness usually expected by manufacturers of steel tubing not produced by the extrusion process, which runs as high as 10% to 12%.

D. H. S. Bronze

A new leaflet describing the uses and advantages of D-H-S (Ductility, Hardness, Strength) bronze for the steel industry has just been published by the Koppers Co., Bartlett Hayward division, Baltimore, Md.

The folder lists recommended applications and minimum physical properties of D-H-S bronze No. 1, 2, 3 and 4 and states that D-H-S bronze offers the highest combination of mechanical properties ever attained in a bronze alloy, and combines extreme fineness and density of grain structure with close binding and cleavage of all elements. Its properties are not due to analysis alone, but also to the technical and metallurgical control which is continuously maintained throughout manufacture.



No. 16 TOGGLE PUNCH PRESS

The No. 16 TOGGLE with large die space is suitable for punching and shearing tie plates, punching and straightening splice bars, also for general manufacturing press, punching and shearing articles. Drive is mounted inside of frame.

The Press is equipped with magnetic or air clutch. This is a high speed heavy duty Press for many applications.

GENERAL DIMENSIONS:

	No. 16	No. 16A	No. 16B
Face of slide, right to left	43'	53'	62'
Face of slide, front to back	24'	26'	26'
Die space, slide down	20'	20'	20'
Stroke; Standard	3'	3'	3'
Maximum	5'	5'	5'
Face of table, right to left	53'	60'	66'
Face of table, front to back	24'	26'	26'
Capacity	700T	850T	1000T
Strokes	40	35	30
Depth of throat	15½'	15½'	15½'
Weight	76,000	82,000	88,000 lb.
Motor required Horse Power	20	30	40

BEATTY MACHINE & MANUFACTURING CO.

HAMMOND, INDIANA

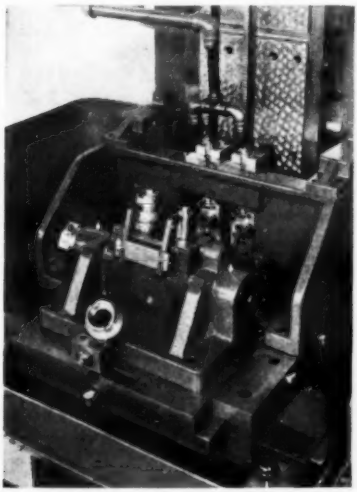
ALSO BUILDERS OF

Punches: Single and Double—"C" Frame
Horizontal Punches
Multiple Punches
Gate Shears
Bar Shears
Angle Shears
Splitting Shears
Coping Machines
The CoPun Shear (Cope Punch Shear)
Vertical Bulldozers
Spacing Tables
Hydraulic Press Brake and Flanger.
Hydraulic Presses.

Broaching "41" Auto Parts

SEMI - AUTOMATIC transmissions for 1941 automobiles are bringing with them numerous innovations and improvements in manufacturing methods to turn out, at reasonable costs, the parts for these relatively more costly units.

A typical operation is shown. The part, in the foreground, is a gear out of a semi-automatic transmission. The operation required was to cut the slots shown on the front side. These slots have to be held to .003" for size and .002" for centrality with the bore.



To produce the parts to these accuracies at the "4-a-minute" rate required, a Colonial single ram broaching machine was selected and adapted, using two sets of broaches, fixtures, etc.

Instead of having broaches directly attached to the ram and pushed through the work, as usual, the broaches are of floating construction and pulled through broach guides and work by broach pullers connected with ram in base of machine. The fixtures which locate the parts during cutting, serve as guides for the broach so that any weaving or distortion below or above the fixture during broaching, has no effect on the actual cutting itself.

The broach guides, it will be noted, incorporate a pilot for locating the part, thereby assuring accuracy of location of the machined slots in relation to the bore of the part. To provide ease of loading, the fixture table is of the receding or shuttling type, while the fixture on which the parts are loaded, is of the trunnion or "tilting" construction.

In operation, two parts are placed over studs on the fixture while in the position shown. Just before the machine ram starts down, the fixture table starts to move in toward the broach guides. As it does, the fixture tilts forward, so that, as the table finishes its forward movement, the bores of the two parts are located over the pilots in the broach guides.

At this point, the machine ram has started to move down. The broach pullers — permanently connected to the broaches—pull the tools through the guides, rough and finish cutting the slots. At the end of the down stroke, the fixture table automatically shuttles backward, out of the way, at the same time tilting the fixture backward.

Cutting speed is 30 feet per minute with a return stroke of 60 feet per minute. Production is at around 240 pieces per hour with two parts finished for each cycle. The 5 ton, 42" stroke single ram machine, fixtures, and broaches were designed and built by Colonial Broach Co., Detroit.

What's New in the Industry

American Differential Case Broaching Machine

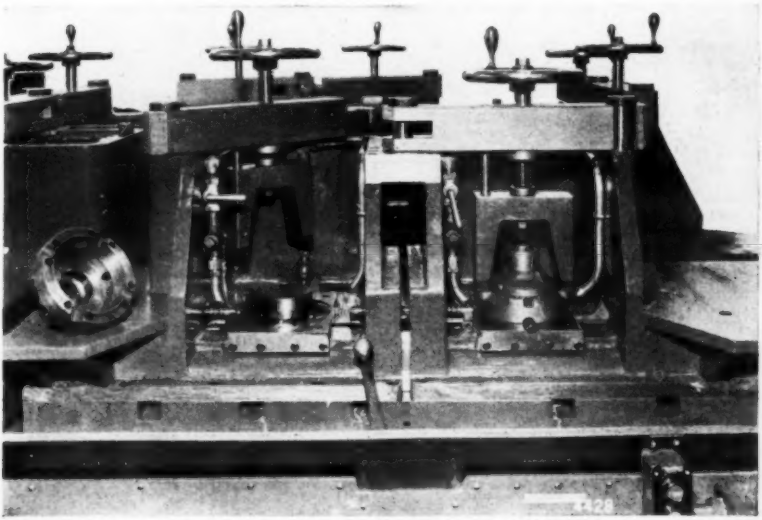
A UNIQUE broaching machine has been built to meet special requirements of a customer of American Broach & Machine Co., Ann Arbor, Mich.

It was arranged for finish broaching the half round slots in differential cases and was used for several sizes. The machine was equipped with four cylinders for surface broaching, providing four stations, having two fixtures to each station. It involved a permanent setup with two fixture stations on each side of machine. Any of four differential case halves, making up two separate differential case assemblies, can be finished without tooling change-over.

The machine is a special 4 HC-18 horizontal unit. Fabricated machine base contains oil reservoir, coolant reservoir, coolant pump, hydraulic pumping unit, valving and motor. Inclined trough conveys chips to one corner of base for convenient removal.

Four machine slide units are provided. One on each of the four sides. All four cylinders are connected to hydraulic pump unit. Design is such that any one side of machine may be operated, and that two adjacent sides may be operated simultaneously by two different operators. Separate machine control is provided for each cylinder slide assembly.

Fixtures were designed to locate from joint counterbore or shoulder of two parts, forming one case assembly. One-



half of the assembly is completed on two fixtures on one side of machine as shown. Index for first pass is taken from one of the flange holes (lefthand station) and for the second pass from the previously broached half round (righthand station). Manually operated screw type clamp of swing out construction is provided. Fixture plates are adjustable laterally to facilitate tooling setup. Adjustment is provided in broach holders relative to fixture. Work rest pads are provided at side of each fixture.

Material, malleable iron. Stock, .010" on radius. Production, 90 pieces per hour from each side of machine.

Specifications: — Normal capacity — 4 tons, each cylinder. Cylinder diameter —5". Broaching speed—18 f.p.m. Return speed — 28 f. p. m. Cylinder stroke—18". Work height—40". Overall height—50". Net weight with tooling—10,000 pounds. Operating space—14' x 14'.

Red Ring Gear Grinder

Developed originally for precision grinding of master gears and involute broaches in National Broach & Machine Co.,'s plant, Detroit, a new Red Ring machine is said to offer many advantages.

It is exceptionally rigid, utilizing a "U" type column, with wheel spindle mounted on long bearings. Spindle is integral with motor rotor.

The spindle slide is adjustable up and down by a hand wheel. Hydraulic counterbalance removes backlash from the lead screw. Operation of down feed against hydraulic pressure is claimed to eliminate possibility of the head sticking when small increments of down feed are desired.

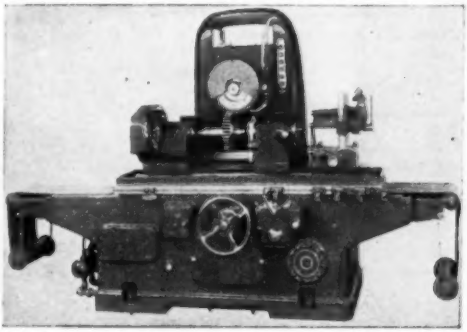
The table slide is hydraulically reciprocated and automatically controlled through a feed box on front. Table speed is controlled to a high degree of precision. A cam on the table slide provides force feed lubrication to the ways at each stroke. The combination V and flat ways are covered at all times by a canvas roll.

Index head is furnished with either fully automatic or semi-automatic control, as desired. Semi-automatic provides greater accuracy.

For gear tooth work, a template control trimmer is provided which trims both sides of wheel simultaneously. The table feed box includes a dead stop which brings the wheel to trimming position so that the diamond points operate exactly in line with center of wheel. The radius trimmer is mounted in tail stock. Diamond points are adjustable up and down — may be set with a micrometer.

Coolant and hydraulic pumps are external. Reservoirs are inside base.

Grinding time is greatly reduced when gears are shaved before hardening and grinding—lapped afterwards. This cycle produces better gears in less time. It is reported that in one instance, a 12" diameter x 2" face gear, requiring a normal grinding time of 60' was handled in a combined grinding and lapping time of 20'; and shaving requires less time than the finish cutting operation which it eliminates.



Decision in Patent Suit

On June 22, 1940 a decision was rendered in the District Court of the Unit-

WHEN PRECISION GUARDS PRECISION

It is an old saying that "It's a poor workman who blames his tools". But shop foremen know that even the best operator cannot turn out precise and well finished work on a lathe with worn or faulty headstock gears.

To make sure of maintained accuracy at this vital spot, a well-known lathe maker has standardized on carburized Nickel-Molybdenum steels — using SAE 4815 for drive gears and SAE 4615 for the transmission gears.

These two Molybdenum steels, in addition to having the requisite core strength and toughness, carburize to 55-60 Rockwell "C" with minimum distortion. Consequently proper initial adjustment is simple and freedom from trouble due to worn teeth is assured for an extended service period. Thus precision guards precision for years.

Rechecking your own specifications may disclose opportunities for increasing serviceability of the product by a change in materials. You will find our book, "Molybdenum in Steel", helpful. It is sent free on request.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Molybdenum Company
500 Fifth Avenue, New York City

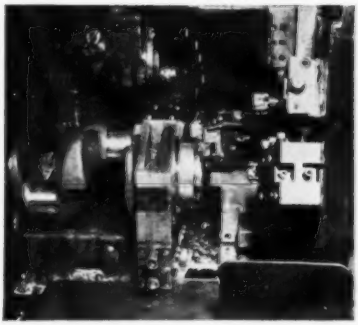
MOLY

ed States, Southern Division, Eastern District of Michigan in the case of the General Electric Co., and Carboloy Co., vs. The Willey's Carbide Tool Co.

The suit related to certain methods of production, manufacture and sale of tungsten carbide dies and tools and a decree was rendered in favor of the defendant, The Willey's Carbide Tool Co., The Industrial Diamond Co., and Fay H. Willey.

Turning Crankshaft Ends

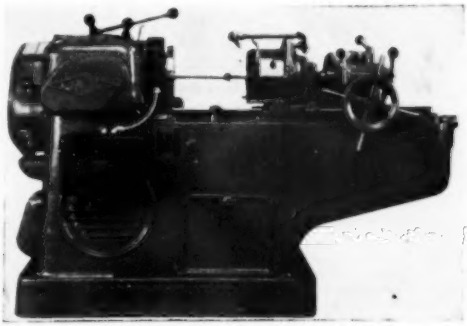
Electric chucking and use of cemented carbide tools are features of this Sundstrand lathe for turning the ends of crankshafts at the plant of a leading producer of low priced cars. The lathe used is provided with three tool posts, one a vertical and two on horizontal slides at the front and back of the machine.



The operation is completely automatic. The crankshaft is merely placed on the machine and removed by the operator when machining is completed. Machining consists of boring and reaming the tranmission pilot bearing hole, boring the retainer hole, facing the crankshaft flange, and end of pilot and turning the O.D. of the flange and pilot, turn groove and chamfer.

Carboloy 907 turning and facing tools are used. Production given is approximately 25 shafts per hour per machine. Approximately 600 pieces are obtained per tool grind—one grind for every 24 hours of machine operation.

Landmaco for Special Threading Operations



The machine shown was developed for special threading operations in which extremely close tolerances for concentricity had to be maintained between thread and body of work. Since such work is usually ground, the grinding operation being handled by supporting the work between centers, provision is made for supporting the work.

Special mechanical features include a face plate on machine spindle, supplanting the usual die head; a special carriage front on which die head is mounted, and a tail stock which is adjustable and also supports a center.

The face plate, incorporating a live center, is employed in exactly the same manner as the face plate on a grinding machine or lathe.

The special carriage supports the Lanco die head, used as a stationary type head. The head ordinarily is applied to a live spindle. Provision is made for opening and closing die head with a yoke, when necessary.

The adjustable tailstock is clamped into position on ways located on side of machine bed. These ways are of sufficient length to permit handling work ranging from 2" to 16" long.

Tailstock center is advanced to, or withdrawn from work by a quick-acting lever located on top of tailstock. Movement of this center is actuated by a rack and pinion gear. The center can be clamped rigidly into position.

The unit is of the lead-screw type. Thus it can be seen that the thread is generated by revolving the work between centers, the die head being propelled onto the work and the thread lead being controlled by means of the leadscrew.

Manufacturers are the Landis Machine Co., Waynesboro, Pa.

Reeves Vari-Speed Jr.

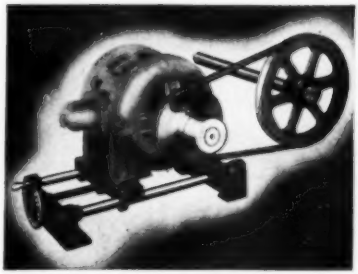
Reeves Pulley Co., Columbus, Ind., announces a Vari-Speed Jr. bringing the many advantages of variable speed control to small, light machinery.

By means of this low-cost unit,

standard constant speed motors are easily and inexpensively converted into variable speed units. No special shaft extension is required.

The standard unit comprises a disc assembly and adjustable motor base. The disc assembly consists of two cone-shaped discs (one stationary and one laterally adjustable); a self-adjusting tension spring, a spring adjusting nut and cover. This assembly is applied directly to the standard shaft extension of the motor and the motor is mounted on an adjustable base. The V-belt, driving between the two discs, and the sheave pulley on the driven shaft, is a standard Section "A" or "B" belt.

By means of an adjusting handwheel, motor is moved forward and back.



When nearest the driven sheave, the V-belt runs over the largest diameter on the discs and maximum speed is obtained. Reversing the handwheel moves the motor away from the driven sheave, the V-belt runs over smaller diameter on the discs (the adjustable disc moving out to accommodate the belt), and speed is reduced. When the motor is farthest from the driven sheave, minimum speed is attained.

Speed variation is "infinite" within the limits of the unit—i. e., a countless number of operating speeds are available without "steps" — accomplished while machine is running.

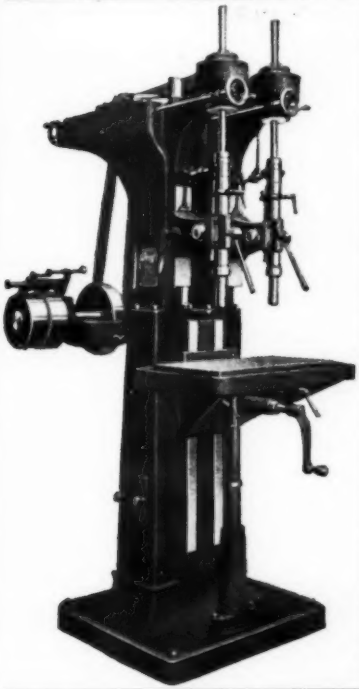
The unit is built in six different sizes of disc assembly, for use with motors of from ⅛ to 1½ h. p. providing speed control over a range of from 1¾:1 to 2¾:1, inclusive, depending upon the size, h.p. and speed of unit selected. Two sizes of motor bases are available.

The unit is also available in a countershaft type for requirements of either unusual speed reduction or speed increase.

THE VALUE OF A TOOL
Depends on
WHAT IT WILL PRODUCE

The Cost of Finished Work is the real consideration

HOW GOOD - - - HOW FAST



If you are interested
in
Good Drilling
Good Tapping

Ask **Avey**

Si se interesa Ud. en buenos trabajos de barrenar y roscar, consulte a AVEY.

We have
Tapping Attachments
as well as
Built in Tappers
All Are Quality Tools

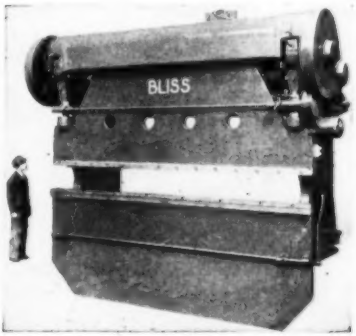
Tenemos aditamentos de roscar, así como Roscadoras de Construcción Integral.

THE AVEY DRILLING MACHINE CO.
CINCINNATI

Bliss Presents New Press Brake

E. W. Bliss Co., 53rd St., and 2nd Ave., Brooklyn, N. Y., introduces an addition to their line of all-steel press brakes. It is equipped to handle a wide range of different types of work, with a capacity of ¼" x 12' mild steel. Deflection in bed and slide is held to a minimum by the use of generously proportioned beam members, giving rigid contruction, yet retaining a smooth pleasing appearance.

An electrically operated friction clutch, designed especially for "Bliss" press brakes is employed.

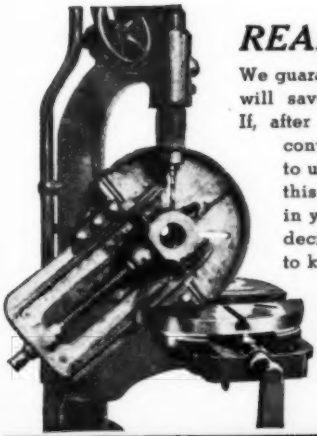


Bronze bushings are provided for eccentric shaft and intermediate shaft bearings and a V-belt motor drive is used. Intermediate gearing is lubricated by oil or grease contained in oil-tight housings while guards for the larger gears retain the lubricant.

Specifications: — Distance between housings, 12' 6"; depth of gap 12"; stroke of slide 3"; adjustment of slide by motor 6"; distance bed to slide with stroke down, adjustment up 12"; the machine operates at 30 strokes per minute.

Free Trial Offer

This Safety Tool on your Drill Press is Guaranteed to save its Cost in labor alone every six months



READ THIS GUARANTEE!!

We guarantee that the Combination Drill Table and Vise will save its cost in six months' time on labor alone. If, after 30 days' trial on your Drill Press you are not convinced of this, you may return the Combination to us at our expense. There are no strings attached to this guarantee in any way. We put the Combination in your shop, let you try it, and after 30 days' time a decision is entirely up to you as to whether you wish to keep it or not. If you decide to return it you may ship it back, transportation charges collect.

Let us know which size you wish, and we will ship a Combination to you at our expense for a FREE 30 DAY TRIAL.

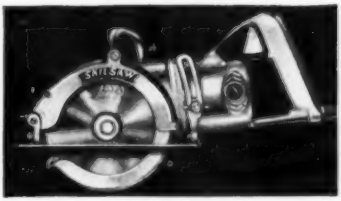
Write today to

MODERN MACHINE TOOL CO., JACKSON, MICHIGAN

A New 6" Skilsaw

An improved 6" Skilsaw has been added by Skilsaw, Inc., 4747 Winnemac Ave., Chicago.

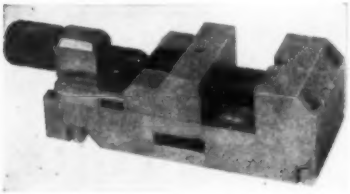
Known as model "67", it is a powerful 6" saw for heavy duty service. It is more compact and is ideal for use



by the carpenter - builder on small homes, garages and for general remodeling work as well as for all intermittent maintenance sawing, except flooring work. May also be used with abrasive discs for scoring tile, concrete, etc. and for tuck-pointing. It cuts to a depth of 7-7/8". Will rip and cross-cut hard wood up to 1"; cross-cut dressed pine lumber up to 2"; bevel cut lumber 1-3/16" thick at 45°. The blade has a free speed of 3400 r.p.m. and is protected by an automatic telescopic guard that rotates on ball bearings. The base is easily adjusted for depth and bevel cutting. Every moving shaft is mounted on high quality ball bearings for quiet operation and long life. It is 15½" long and weighs only 11 lbs.

The Anglemaster Sine Vise

Marburg Brothers, Inc., 90 West St., New York, N. Y., offer a new sine vise that should appeal to skilled toolmakers. Manufactured from suitable steel, heat treated and seasoned before finishing, the vise embodies the features of a rugged useful tool and a precision gage.



Quickly and accurately it handles angle grinding, inspection, or layout. It is ground and lapped to be perfectly level, parallel, and square, thus being adaptable to a wide variety of useful applications throughout the tool room and shop.

New Features include: 1. Precision sine rolls, exactly 5" apart, which permit quick, accurate angle setting. In grinding, ordinary magnetic chucks will hold the Anglemaster at any angle by means of a size block or planer gage—without strapping or clamping devices.

2. The non-projecting telescoping screw, provides pressure to the slide jaw where it is most efficient and effective.

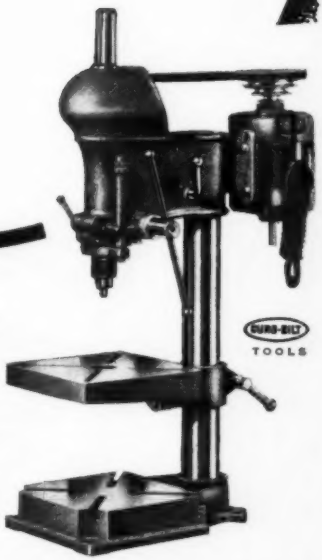
3. The removable knurled screw knob, held in place by an internal spring and easily detached after work is correctly set, thus insuring against accidental change in setup.

4. The slide jaw, lapped to a precise fit, which will not raise with the work. With a piece gripped firmly between the jaws at one end, actual measurement is claimed to show less than .001" variation between the jaws at the opposite end.

5. An accurate integral V-block, provided by a V-slot in the exact center of the fixed jaw.

Length overall is 6". Length between

Here's why we say DURO DRILL PRESSES Are Superior



A quick glance at the illustration above *will not* show you why Duro Drill Presses are superior—BUT *take a few minutes to study and analyze their construction*—We'll leave the decision to you.

You'll find many features in construction that assures greater accuracy, greater strength and longer life at a very low cost. —To prove this, send for our catalog describing their construction in detail.

Made By
The Manufacturers of America's Finest and Most Complete Line of Power Driven Machinery.

DURO METAL PRODUCTS CO.
DEPT. BB8, - 2655 N. KILDARE AVE., CHICAGO, ILL.

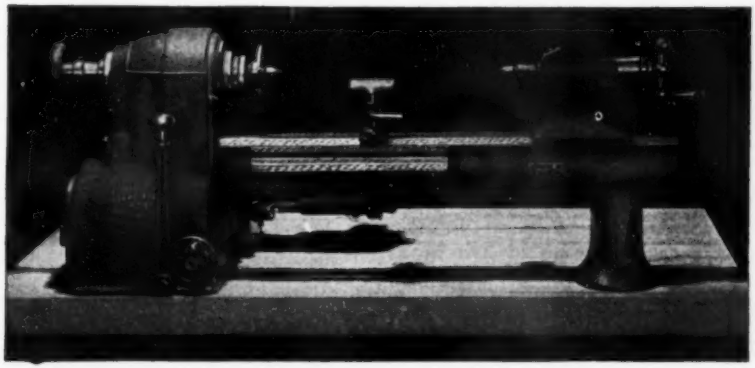
sine rolls is 5". Width is 2½". Height is 2". Depth of jaws, 1". Travel of slide jaw, 3". Net weight, 5¼ lbs. Shipping weight, 6¼ lbs.

612 Pounds of Chips Per Hour

A recent job at General Electric Co., showed chip removal at the rate of 612 lbs., per hour using two single point Carboloy tipped turning tools. It involved turning a steel casting for a rotor spider hub. It is reported that

the cost was recently cut to ½ cent per lb., of chips, including tools and labor, through the use of carbide tooling. Depth of cut was ¾" with a 1/16" feed per revolution. Due to the angle of the tool, chips were approximately 1" wide.

An interesting side light on this job was that the use of high speed steel for machining had previously necessitated stopping every 3 or 4 revolutions, due to breakage caused by blow holes and sand, while with the carbide tools, the cut could be taken the entire length of the riser before regrinding, a distance of 37".



DON'T BUY UNTIL YOU HAVE SEEN THE

NEW--"Stark"

Integral Drive Precision Bench Lathe
PATENTED

ITS BUILT-IN DRIVE LEADS ALL COMPETITORS

The first tool of its class with built-in motor and speed changing mechanism, entirely eliminating mill wrighting.

Nothing under the bench . . . nothing overhead. Special bench or even bolting to bench, unnecessary.

The ½ h. p. geared ball bearing motor drives through a disc clutch and vertical V belt sheaves, and through V belts to the headstock, giving any speed at the turn of a wheel (located in front of lathe) from 156 to 2200 r.p.m. in Standard Model, and 260 to 3500 r.p.m. in High Speed Model. Speeds registered on a neat indicator.

Simply moving control lever to right engages the clutch, vertical position releases, moving to the left instantly brakes the moving spindle.

Time-tried Stark double taper bearings in Standard Model. Best precision preloaded anti-friction bearings in High Speed Model.

Both ¾ and 1 inch collet capacity furnished in either model . . . 9 inch swing . . . 40 inch length of bed . . . Weighs 310 pounds . . . Takes regular Stark Attachments, Collets and Chucks.

Stark accuracy and stamina are traditional . . . incorporated in this streamlined new lathe.

Priced at only slightly more than other precision lathes with SEPARATE complicated drives.

STARK TOOL CO. WALTHAM, MASS, U.S.A.

ESTABLISHED 1862 • ORIGINATORS OF THE AMERICAN BENCH LATHE

Rogers Cabinet Base Knife Grinder

A new Type B-26-60 cabinet base knife grinder has been developed by Samuel C. Rogers & Co., 191 Dutton Ave., Buffalo, N. Y.

An outstanding feature is the long cabinet type of base which extends the entire length of the heavy, box type bed, eliminating the need for extra end standards. Designed for "edge up" grinding, it may also be adjusted for grinding "edge down" if desired.

Transmission is of the straight and cross belt and shifting lever type, designed for maximum smoothness of traverse and shifting, for accurately ground cutting edges.

The machine is adjustable for grinding flat or concave bevels. It is equipped with full automatic cross feed —10" cup grinding wheel, self contained, wet grinding attachment, and is adjustable for various lengths of knives up to the capacity of the machine.

Motor driven units are equipped with ½ h.p., ball bearing motors. Belt driven machines have 8" diameter tight and loose pulleys and should run at 1200 r.p.m. Table speed is at the rate of about 30 feet per minute with a grinding speed of approximately 3600 s.f.p.m.

Five models are offered to handle maximum knife lengths from 26" to 60".

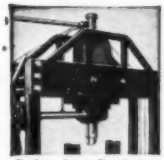
Trico Loose Pulley Oiler

A new, visible, unbreakable loose pulley oiler for slow and high speed applications, without flooding, is announced by the Trico Fuse Mfg. Co., 2949 N. 5th St., Milwaukee, Wis.

The oiler illustrated is intended to replace common grease or oil cups supplying visible, automatic, fool - proof lubrication, prolonging the life of

KRW HYDRAULIC ARBOR PRESSES

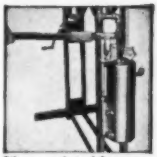
HAVE SPEED AND POWER FOR INDUSTRIAL USE



Rack teeth cut directly into ram—no separate rack bar.

Heavily constructed enclosed drum and ratchet raises and lowers bed.

Extensible cross-arms for greater leverage have locating grooves for extended and central positions.



Oil reservoir tank has convenient filling plug and shut-off valves.

V blocks furnished have machined shoulders for accurate alignment on bed.

Machined shoulders align V blocks when in inverted position and prevent slippage.

Built with the speed and strength necessary for industrial use, KRW Presses perform such operations as broaching, assembling, straightening, bending, offsetting, squeezing, pressing, and flattening. Small blanking operations can be performed when the blanking dies are built into a die set provided with guide pins.

Strictly a one-man press, special KRW features minimize operator fatigue. Trussed design of bed and crown members results in extreme rigidity and accuracy.

Write for new bulletin describing this cost-cutting equipment.

PRICES F. O. B. FACTORY, ARCADE, N. Y.

PRICES SLIGHTLY HIGHER WEST OF ROCKIES

No. 37—25 ton Hydraulic and Sensitive Arbor Press	$180.00
No. 37E—50 ton Hydraulic and Sensitive Arbor Press	235.00
No. 37F—75 ton Hydraulic and Sensitive Arbor Press	365.00

K. R. WILSON

27 Lock Street, Buffalo, N. Y., U.S.A.

Export Department
90 West St., New York, N. Y.

West Coast Branch
722 Mateo St., Los Angeles

bearings and eliminating costly shutdowns and repairs.

Three distinct principles of operation are employed:—thermal, capillary and gravity action. The copper tube transmits the heat of the pulley hub to the oil reservoir to produce quick thermal action; the wire re-inforced wick feeds oil by capillary action, and it is dropped on the bearing by gravity.

Available in one and two ounce capacities with ⅛" or ¼" pipe thread fittings.

U. S. Electrical Motors Builds Eastern Plant

Reversing the expansion procedure of eastern manufacturers who build branch plants on the Pacific coast, a west coast electric motor manufacturer is building a new plant on the Atlantic coast. Construction has begun on a complete production plant at Milford, Conn., by U. S. Electrical Motors, Inc., a California concern.

The site is on the main of the New York, New Haven and Hartford Railroad, 63 miles out of New York City. The plant will be completed in November and will be equipped with new machinery for the production of electrical motors, including horizontal, vertical, Varidrive and Syncrogear types, and aircraft testing auxiliary motors.

The firm's west coast plant is located in Los Angeles and heretofore shipments to the Atlantic coast have been made from California, with assembly operations carried on in Brooklyn. The firm also maintains a Chicago assembly plant.

Seybold Precision Knife Grinder

A newly designed 100" precision knife grinder is offered by the Seybold Division, Harris-Seybold-Potter Co., Dayton, O. It is a high speed machine with automatic grinding wheel feed and centrifugal pump cooling system. Removing a minimum of metal, it quickly produces a keen, true cutting edge that requires little honing.

It does not require an experienced operator, and grinds equally well, shear blades or beveled knives such as planer, chipper, hog, barker, veneer, paper, rag, granulating, tobacco, and scraper or doctor blades—in fact, almost all straight knives in general use.

A unique feature is a hollow three-sided knife bar, each surface presenting a different series of angles to the action of the traveling grinding wheel. A fourth open side makes it easy to bolt or clamp various types of blades to the bar.

On the surface of the knife bar, where most of the grinding of paper cutting knives is done, the stud-nut principle for fastening the clamps has been retained. This gives a definite position for the clamps and permits uniform spacing.

In designing the new machine, special consideration was given to shear blade grinding. A variety of sizes can be accommodated and up to 6" widths can be ground satisfactorily. The adjacent surfaces of the knife bar are made to accommodate almost all straight edge knives that are in general use.

All gears and the clutch operate in an oil bath. Adjustments and controls have been simplified.

The Grinder is made in three standard sizes—70", 100" and 128" lengths—other sizes to order.

C-F Welding Positioner

Recently added to the C-F line of welding stands is the new size, Model 12 Positioner, capacity 1,200 pounds. Like other units of this line, Model 12 can be tilted a total of 135° from horizontal and table can be revolved through a full circle (360°) regardless of angle of tilt. Table is removable for attachment of special jigs or fixtures and is adjustable in height. By mounting the operating mechanism on a special base, extremely large and bulky work can be fully rotated when tilted either vertical or a total of 135° without any interference from floor or pedestal mounting.

The unit can be furnished fully powered wth independent motor and controls for table tilt and table rotation. Power for table rotation can be furnished with either constant or variable speed drive. It can also be furnished for manual operation with independent hand wheel for table tilt and table rotation, or a combination of manual and power operation.

Other advantages claimed for these 1 set-up universal units are: self-locking in any set position—safer, more convenient.

Manufacturers are the Cullen-Friestedt Co., Chicago, Ill.

A. C. Flex-Arc Welder

A new all-purpose portable a.c. welder designed for all-around general utility service and production welding of every type, is announced by the Westinghouse Electric & Mfg. Co., Dept. 7-N-20, East Pittsburgh, Pa. Standard models operate on either 220 or 440 volts, are completely self-contained, and incorporate several distinct new design features.

From 20 to 250 amperes of welding current is available in 27 current steps, with increments properly proportioned to meet the needs of welding with a wide variety of electrode types and diameters. Current adjustment is easy; just select the current desired, insert the bayonet plugs in the proper receptacles and the machine is ready to weld. Current values are clearly indicated in large legible numerals.

Safety is well provided for. A built-in "De-Ion" breaker insures protection against long sustained overloads, such as might occur by accidentally leaving the machine short circuited. This is convenient, too, for disconnecting the machine from the line without having to go back to a service or feeder switch. Open circuit or striking voltage is exceptionally low, being on the

order of 80 volts at 20 amperes, and ranging down to 50 volts at the highest current rating.

The welder is completely self-contained and portable, being enclosed in a rugged steel case, mounted on three wheels. High efficiency, high power factor, and low no load losses assure maximum operating economies. The welder is furnished complete with all accessories, including welding helmet with lens, electrode holder, all leads, and a 17 pound assortment of electrodes. A three-pronged plug and receptacle for the power lead is included.

Stepping-Up Cutting Speeds

A bulletin issued by General Tool & Die Corp., 62 Franklin St., East Orange, N. J., thus analyzes an interesting example of the savings resulting from a 100% increase in cutting speed:

A—The machine tool operator earns $1.00 per hour, or $8.00 per eight hour day.

B — Rexalloy tools are claimed to operate at 100% increase in speed over H. S. S. tools.

C—Percent of cutting time contrasted with total time will average 70%. Percentage of down time to total time will be 30%.

The question is the amount of money saved per day and per hour, and the percent increase in production under conditions A, B and C.

Total time per day in minutes figures eight hours x 60 minutes per hour or 480 minutes.

Total down time per day equals 480 minutes x 30% or 144 minutes.

Total cutting time per day equals 480 minutes x 70% or 336 minutes.

A 100% increase in speed affects the cutting time only. The operator would be expending 336 minutes' cutting time with H. S. S., or should be able to machine the same amount of work in half this time (168 minutes) with Rexalloy.

If the same amount of work were done in 312 minutes with Rexalloy tools as performed in 480 minutes with H. S. S., there is a substantial increase in production, determined by subtracting 312 from 480 minutes which gives 168 minutes and dividing this by 312 which gives 54%.

The saving per day is calculated by multiplying $8.00 by .54 or $4.32. Dividing $4.32 by eight gives 54c as the saving per hour, which would soon pay for the improved tools.

J. & L. Turret Lathe Tools

Three new sheets have been issued for the "Tools For Turret Lathes," catalogue of Jones & Lamson Machine Co., Springfield, Vt.

These sheets replace pages, numbered in Roman figures; 2 and 3; 6 and 7; and, 8 and 9; which should be removed from the catalogue and destroyed.

A gummed photographic sheet shows how to insert the new leaves.

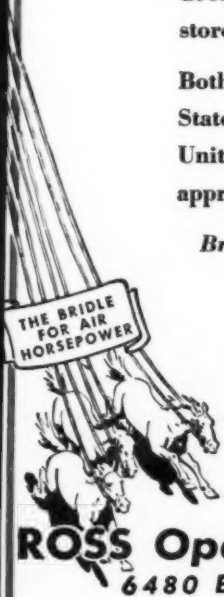
They are preparing, for this catalogue, many new sheets which will be issued in the near future. It is the intention, to cover the whole line of J. & L. Standard Turret Lathe Tools eventually, and to use this book as a medium to inform users of the production of new or improved tools.

The SEAL of GOVERNMENT APPROVAL

ROSS VALVES were selected by the U. S. Navy, for the control of elevator operation on airplane carriers . . . They are used at Fort Knox, to operate the immense door which guards the billions of gold stored there in underground vaults.

Both the *Government* of the United States, and the *Industry* of the United States have placed the seal of approval on Ross Air Control Valves.

Bring your air control problems to Ross.



ROSS *Air Control* **VALVES**

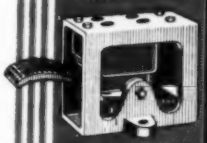
ROSS Operating VALVE CO.

6480 Epworth Boulevard

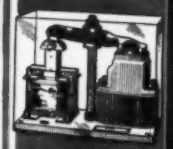
DETROIT, MICHIGAN

A SIZE AND TYPE FOR EVERY OPERATION

HAND CONTROL



FOOT CONTROL



SOLENOID CONTROL

MECHANICAL CONTROL

ALL AIR CONTROL

PILOT CONTROL

Manufacturing Kennametal

A new 6-page folder describing how Kennametal is manufactured, where it can be used and its advantages as tool material for machining steel of all hardnesses up to 550 Brinell, has just been issued by McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa.

Entitled "Cut Steel Profitably with Kennametal Tools and Blanks," the new folder contains complete factual data on this new hard carbide tool material, yet can be easily read in 15 minutes. Three tables describe (1) the comparative physical properties of Kennametal, (2) materials machined with Kennametal and (3) recommended speeds for machining steels of various hardnesses. A chart on Page (4) demonstrates the increased cutting speeds and greater hardness range of steels machined with Kennametal, as compared to cobalt chrome alloys and high speed steel. Illustrations show typical turning, milling and shaping operations employing Kennametal-tipped tools.

Boosting Grinder Production

A manufacturer of cylinder valve seat inserts for aircraft engines had been grinding 500 pieces per hour on one machine. In seeking to step-up production he found a "bottleneck" in an extra demagnetizing and cleaning job after grinding.

During the grinding operation, the valve seats became strongly magnetized from the magnetic chuck—and had to be demagnetized to get rid of clinging ferrous particles.

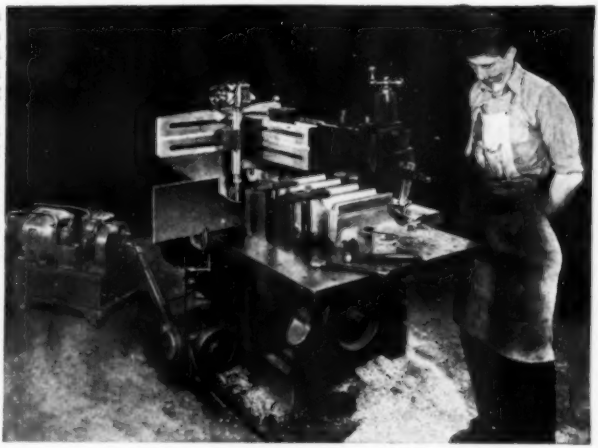
In telling about the incident, Mr. Litwin of Electo-Matic Products Co., 4036 N. Kolmar Ave., Chicago explained that installation of a "Neu-T-Rol" magnetic chuck control made it possible to raise production to 900 pieces per hour—releasing the pieces promptly from the chuck, eliminating prying loose of the parts as well as demagnetizing and cleaning operations.

A Canadian Company had always experienced difficulty demagnetizing small watch and clock pins after grinding. Their experience was similar to that already related.

Another Company using many extra large dies had tried to purchase a demagnetizer big enough to use on them. They had been dismantling dies after grinding, to demagnetize the punches. It was advantageous for them to install a magnetic chuck control which released and demagnetized the heavy pieces at one operation.

"Neu-T-Rol" equipment is made for all sizes of magnetic chucks, and where it is specified on new grinding equipment, the manufacturers will build it in, ready for use. It can be installed easily on grinding machines that are already in service. Helpful on smaller machines, it is particularly useful on the larger sizes of magnetic chucks where work pieces are heavy and it is otherwise necessary to use considerable physical force at times to pry parts loose. Such extra exertion tires and exasperates the operator and prompt release of parts from magnetic chucks is one of the first steps in raising grinder production rates. It saves wear and tear on the operator, the parts and the chuck face. Often it saves an extra demagnetizing operation.

Form Shaping With Duplicator Control



Automatic form cutting with a shaper, through the use of a form duplicating control is an interesting cost and time saving development recently introduced at Peerless Pattern Works, Detroit. The idea arose from a problem of machining the sides of a quantity of magnesium crank case and barrel core boxes to provide for the application of steel wear plates.

Normally such a job would be milled with frequent checking with a floor-to-floor time of roughly three hours per piece. At Peerless however, a die duplicator produced by Detroit Universal Duplicator Co., 229 St. Aubin St., Detroit, was hooked up to a shaper, a template of the form provided, and machining time reduced to about 30 minutes (a saving of better than 80 percent).

Checks indicate, according to Peerless, that a consistent accuracy of within .002" is being maintained in the operation. The duplicator which had been used previously in the same shop for controlling other work requiring duplicating, was merely moved to the shaper and connected with the table elevating mechanism.

As shown, the steel template conforming to the shape of the core box, is mounted on the table of the machine. A tracing finger, supported by a tracer head mounted with a bracket on the shaper, follows the contour of the template, controlling vertical feed, while transverse feed is automatically governed by the setting of the shaper.

The work itself is clamped in duplicate to the table parallel to the template so that several pieces can be machined at one time.

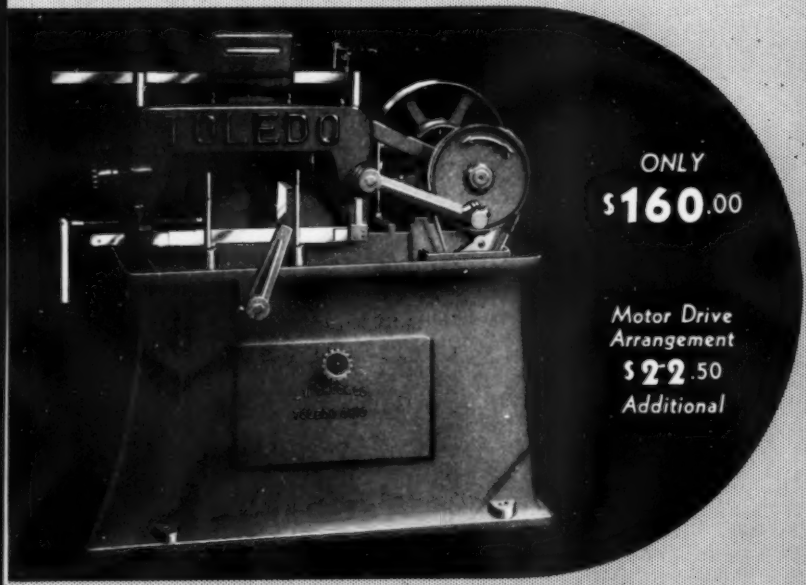
L-W HIGH SPEED POWER HACK SAWS

Quality at Low Cost

IMPROVED DESIGN – HEAVY DUTY – FAST CUTTING. A REAL SAW THAT WILL SAVE YOU TIME AND MONEY.

To start cut, relieve weight of saw frame, hold down on release lever and lower saw to work – start machine. Automatic trip stops the machine on completion of cut. Automatic relief of saw blade on the non-cutting stroke is also provided.

Capacity 6"x6" with 10" to 14" blades — Clutch Pulley 12"x3" — Speed of Pulley 120 r. p. m.



ONLY
$160.00

Motor Drive Arrangement
$22.50
Additional

L-W CHUCK CO.

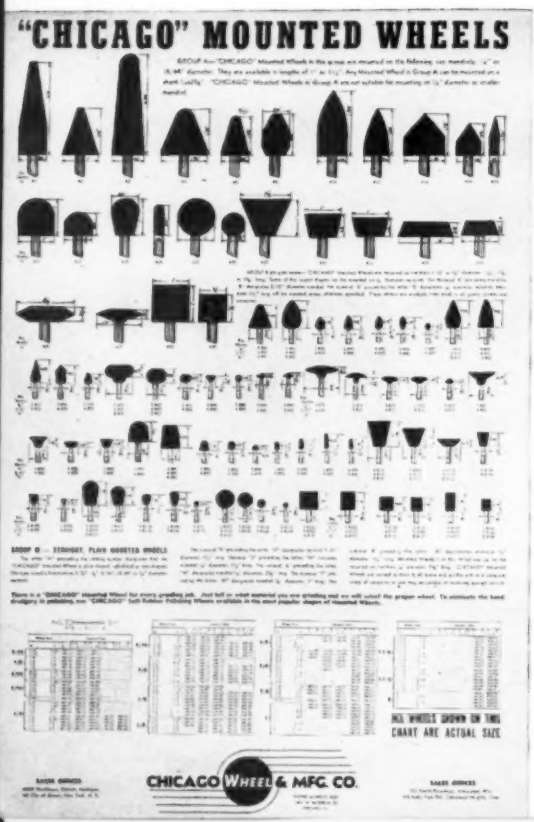
1–7 N. ST. CLAIR ST., TOLEDO, OHIO

CHICAGO MOUNTED WHEELS OF V/T SUP

150% LONGER LIFE

Chicago Mounted Wheels made of the new V/T Super Bond prove by tests cor ducted in many plants on snagging and exacting operations to have from 150% to 300% longer life. They're tougher; can take more punishment; grind mor pieces per wheel, faster and without sacrifice of cutting action.

V/T Super Bond holds its original shape longer. Wheel will not ridge o grinding welds, sharp corners, sinking dies, barbering, and other wor of this character.



V/T Super Bond meets th challenge of today's exac ing requirements. Cut your grinding cost. Let u prove it to you in your ow plant on your toughes mounted wheel job.

Let us send you one of thes Mounted Wheels without co or obligation. Tell us the kin of job, type of equipment an size you want to use to mak your own test.

Complete Catalog Free upon Request.

FREE MOUNTED WHEE CHART

Ideal for ready reference in th shop. A Wall Chart 22x15 showing actual size and shap of every standard Chicag Mounted Wheel.

CHICAGO WHEE

Makers of Quality Pro

1101 W. Monroe St., D

Canadian Distributors: Canadian Trade Corp., Ltd.

R BOND

GREATEST FORWARD STEP IN 30 YEARS

V/T Super Bond is one of the most important developments in mounted wheels. Wherever the use of a tough, hard bond that will stand the gaff is required, V/T Super Bond will be found without peer. Nothing can compare with it in endurance, stamina and performance. There is a shape and size to handle every grinding job faster, better and at lower cost.

Chicago Mounted Wheels

✓ The FIRST small abrasive wheels mounted on steel mandrels to be offered to industry.

✓ The FIRST with this special new and exclusive bond—V/T Super Bond, unequalled in strength and long life.

HANDEE TOOL OF 1001 USES

Here's a small "power house" that can be carried to any part of the shop and used wherever there is an electric outlet. Repairs hard-to-get-at parts on machinery without removing the part—smooths off rough spots on dies and moulds—cleans delicate mechanisms—grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories. There are more Handees in use today than all other tools of this type combined.

De Luxe model weighs 12 oz. 25,000 r.p.m. $18.50 postpaid with 6 Accessories.

TRY A HANDEE FOR 10 DAYS IN YOUR OWN PLANT

HB-9

☐ Send Free Wheel. Size _____
☐ Free Wall Chart
☐ Catalog of Handee Products and Grinding Wheels.
☐ De Luxe Handee on 10-Days Trial.

Name .....

Address .....

& MFG. CO.

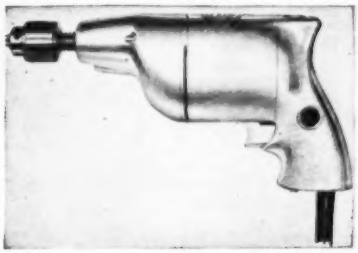
s for 40 Years

HB Chicago, Ill.

1132 Williams St., Montreal

Black & Decker Introduces New Tapper

With the introduction of the Tapgun to the line, Black & Decker Mfg. Co., Towson, Md., now have three powerful, one-handed, high speed production tools of identical grip, build and balance:—Holgun Tapgun and Scrugun.



The new Tapgun weighs only 3-¾ lbs., measures 9-¼" over all, taps up to 5/16" in cast iron, 3/16" in steel, ⅜" in brass or aluminum. It taps at 400 r.p.m. and backs out at 525 r.p.m.

This tool augments the No. 22 Tapper which has been in the line for some years, which is a heavier tool for greater capacity. The No. 22 has a capacity of ⅜" in cast iron, ¼" in steel and ½" in brass or aluminum.

The Holgun and Scrugun are a powerful ¼" drill and a high speed screwdriver for screws from No. 4 to No. 10.

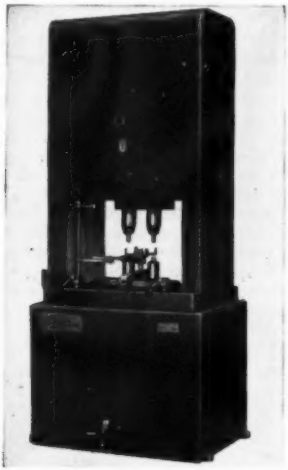
Hanna Announces New Models

The line of electric-hydraulic riveting presses manufactured by Hana Engineering Works, 1765 Elston Ave., Chicago, Ill., has been augmented by the type shown.

In its design, the required floor space has been held to the minimum. Motor, pump, controls, piping, cylinder, and reservoir are totally enclosed which permits the motor being of the open frame type and results in a complete, streamlined machine.

Front and rear panels may be removed in less than a minute to make

motor, pump, and reservoir accessible. A side panel affords access to the controls. The entire machine can be lifted out of its base without disturbing a hydraulic, electrical or mechanical element.



From one to six or more rivets may be driven simultaneously, with equal pressure exerted on each rivet, regardless of variation in length, hardness of rivet, or ordinary variation in grip. Omission of one or more of the rivets will not result in damage to the work or the machine.

Work assembling, loading, aligning, clamping, and rivet nesting features may be built in as shown. The work is illuminated by built-in lamps.

Tonnage adjustment and gauge are directly before the operator's eyes as is the oil level sight glass. Live or driving dies may be above or below. A complete riveting stroke of all dies can be accomplished in less than two seconds. Equipment is available in capacities from 10 to 100 tons.

Red Band Diamond Dressers

The Abrasive Dressing Tool Co., 1550 Broadway, Detroit, announces a new line of diamond tools known as the Abrasive Red Band series, positively identified with a brilliant red band on the shank. In addition to the "Oxide-Free" process which is claimed to secure the diamond in the tool for the entire useful life, other production methods are followed to incorporate economy and long life.

A feature performer is the No. 11, designed for versatility of application as well as general utility. It contains three rows of diamonds, precisely staggered and spaced to permit the tools to be used for single-stone or cluster-type dressing. By regulating the drag-angle, a single stone, or three stones may make contact with the wheel. It can be used for large radius trueing, surface grinders, medium cylindrical grinding and all other tool-room dressing.

No. 11 contains 11 diamonds, weighing approximately 1.25 carats.

Hartley Expands

Hartley Wire Die Co. formerly of Waterbury, Conn. has removed to larger quarters at Thomaston, Conn., increasing by approximately 15,000 square feet, their floor space formerly available.

The Company, producers of Carboloy dies for drawing, sizing and extruding purposes, recently celebrated its 90th anniversary, and is said to have been the first organization in this country to make diamond dies.

Dremel Electric Jig Saw

A handy new electric jig saw has been developed by Dremel Mfg. Co., Racine, Wis., which falls into the category of things somebody ought to have thought of before.

A powerful little electric motor provides 7200 saw strokes per minute and the makers assert that it will cut at the average rate of a foot per minute through ⅛" to ¾" medium hard wood.

Just a trifle heavier than the regular hand scroll saw and better balanced, a light feed pressure suffices and the cut is said to require no sanding. Current consumption is stated to be less than 75 watts and the low price brings it within reach of all.

The usefulness of such a device in intricate and delicate pattern making is obvious. It will handle easily, jobs that are difficult on ordinary bench saws. A touch of the button switch built into the handle starts the saw. Release of the button stops the blade.

There are only two moving parts and

oiling is not required. Weighs 17 ounces and saws to the center of a 20" panel. Turning of a knurled nut adjusts blade stroke from ⅛" to 5/16", for cutting different materials. The saw kerf is about the width of a pencil mark.

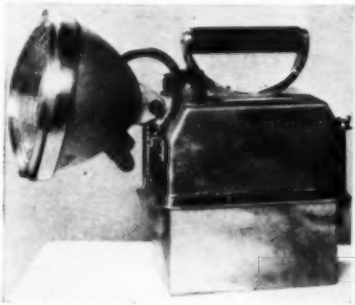
Storage Battery Emergency Lamp

A light for locations, where no electric current is available or where it is hazardous to introduce long, power extension cords, is introduced by the Stewart R. Browne Mfg. Co., Inc., 258 Broadway, New York, N. Y. In case of power failure, operating independently of all power circuits, this Model SB-100 storage battery emergency lamp, can be used for light until normal service is restored. It can be used safely when it is dangerous to use any other kind of light, for repairing leaks in gas mains; working on pipe lines; entering tanks or vessels containing inflammable liquids.

All of the joints between the two parts of the battery case, the lamp and the lens holder, the case and the cord of this Storage Battery Emergency

Lamp are sealed and a vapor-proof switch protects against ignition of explosive gases or vapors.

A special laminated and shatter-proof lens, strong enough to resist a severe



blow, protects the light bulb. A second refractor lens, which more uniformly diffuses the beam, is mounted in the same holder with the shatter-proof lens. Spillage of acid is avoided by a unique design of battery plates which involves the principle of capillary attraction.

Fostoria "Localites"

A new 24-page bulletin (ML-25) introduces the extensive line of industrial lighting equipment produced by Fostoria Pressed Steel Corp., Fostoria, Ohio.

Individual lights for a broad range of machines, tools and equipment are shown, with mounting brackets of all kinds. Included are many of the new fluorescent lamps for adjustable bracket and canopy mounting.

Speed Increasers

A new 24-page illustrated booklet describing the complete line of type SU speed increasers is announced by Westinghouse. These units are designed especially to supply output speeds in excess of those which can be directly obtained with economy and safety from ordinary prime movers.

In successive sections, the ring bound, heavy cover booklet presents application data, construction features, views and explanations of modern manufacturing processes employed, four pages of tables and sketches giving complete dimension information, ordering instructions, and pictures of successful applications.

Flow diagrams, fully described, explain the positive pressure lubrication system used. A full four pages devoted to application data contain tables of input and output r.p.m., horsepower capacities, and explanatory paragraphs on how to use them in selecting the correct gear unit.

Copies of descriptive data booklet 3650 may be obtained from Dept. 8-N-48, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

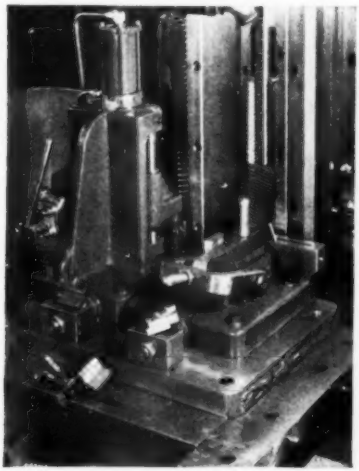
Weldon Adds Tu-Lip Counterbore

The Weldon Tool Co., 3000 Woodhill Road, Cleveland, Ohio announces acquisition of the Tu-Lip Counterbore formerly made by Gopher Machine & Tool Works Co., Minneapolis, Minn. Henceforth it will be known as the Weldon Tu-Lip Counterbore, and will be manufactured and distributed exclusively by Weldon.

Series of Operations on Single Broaching Machine

Broaching frequently permits the performing simultaneously on a single machine of a number of machining operations on the same part—normaily requiring multiple machines and fixtures. A typical example in one of the major automobile companies is shown.

The part is a shifter fork for an automobile transmission. The various machining operations required were:—



1. Flat machining of three adjacent faces of a double-L shaped guide follower. 2. Sinking a large diameter radius contour into one of these faces.

All operations are performed on a single Colonial broaching machine, at the rate of 120 compiete parts per hour, by equipping the machine with two fixtures and two sets of broaches, between which are split up the various machining operations.

Fixtures and upper parts of the multiple broaches are shown in the illustration. The various steps in machining are illustrated by the three parts in the foreground. At left is the rough forged part. Center front is the part

after machining the inside faces of the "L." On the right fixture adjusting block is the shifter fork part with the third surface and radius contour finish broached.

The first group of cutting operations is performed with the part in the left hand fixture. This fixture is air-operated for clamping the part after locating it over a stud by means of the shifter rod hole. It is manually controlled. The right hand fixture may be manually operated. Here, locating again is by means of the shifter rod role.

The fixture table is of the "receding" type, synchronized with machine ram travel to retract fixtures and parts for unloading and reloading during the return stroke of the broach carrying ram.

Productivity is approximately 120 pieces per hour per station. The machine is a 6 ton single ram with 36" stroke. Cutting speed is 30 feet per minute with hgh speed—60 feet per minute — return. Machine, fixtures, and broaches were designed and built by Colonial Broach Co., Detroit.

N. I. A. A. Advertising Clinics

Marketing problems of industry will be threshed out at 10 three-hour clinics at Hotel Statler, Detroit, during the three-day Conference of the National Industrial Advertisers Association, Sept. 18-20. Demands of N.I.A.A. members throughout the country for more time at annual meetings for serious discussions of basic advertising topics and marketing aids brought about the scheduling of these sessions as the backbone of the entire Conference program.

The clinics will supplement two general sessions at which N. I. A. A. members, guests from affiliate advertising organizations and business executives will study industry - wide advertising problems, especially those which have gained importance since the acceleration of national defense plans.

At each of the clinic sessions intimate study of specific advertising problems will be directed by specialists who are working in local groups to gather and

correlate material for the discussions. District chapters in virtually every important industrial area in the United States have each assumed responsibility for one of the ten clinic sessions and will conduct the discussion on the assigned subject.

Halco Universal Hi-Speed Head

Milling, drilling, boring and counter boring on any angle—that's the field covered by the new universal head, developed by Halco Products Co., Detroit, Mich.

The highlights include a sturdy hardened spindle, ground to precision limits, with No. 7 B&S taper for all standard mills—capacity ⅛" to ½" diameter. Also equipped with draw bar for Wellon type holder or collets. (Collet equipment is extra.)

Three radial thrust SKF precision flush ground ball bearings are provided in the substantial housing.

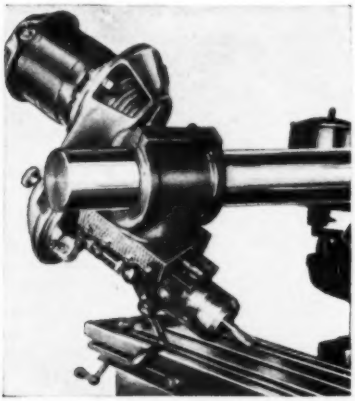
A sturdy cast iron dove tailed slide, precision machined, provides 4" travel and a positive locking stop. An adjustable gib compensates for wear.

A heavy ¾" ground screw with 10-pitch Acme threads is fitted with heavy bronze nut for accuracy and durability. Ball thrust end bearing and adjusting screw take up back lash. Hardened spiral gears are provided for vertical travel.

The heavy overarm clamp is graduated to 360°, bored to fit any mill fitted with spreading screw for easy mounting.

Motor is of the heavy duty G-E ball

bearing type, 1/3 h.p., 110 volt 60 cycle —easily reversible for left hand cutters. Speeds—500 to 2900 or 350 to 2400 r.p.m. Eight speeds, 200 to 2900 r.p.m. available at extra cost. The unit is also available with a 10-speed back gear.



Weighing approximately 90 pounds, the unit can be mounted easily by one man. The 4" vertical travel permits completion of many drilling, milling boring and facing operations in a single setup. The makers assert that the original units were rigorously tested for 1½ years before being placed on the market, and that more than 75 installations are already in service. They also emphasize an unconditional six-months' money-back guarantee.

Illuminating Restricted Corners

"Light piping" properties of "Lucite" (methyl methacrylate plastic), which surgeons have found so useful for introducing direct, "heatless" illumination into body cavities, now are utilized in industry, it is announced by E. I. du Pont de Nemours & Co.

The new instruments function in substantially the same way as surgical instruments. They make it possible to illuminate spots inaccessible to flashlights or other more conventional apparatus. "Lucite" actually transports light around corners, therefore the rods are curved for penetration into obstructed and restricted nooks.

Light originates at the handle, where a metal base holds small, standard-type flash batteries. Interchangeable rods of three different shapes are provided.

Although the instrument looks like the finest crystal, it is non-shattering and may be used safely around machinery and heavy tools.

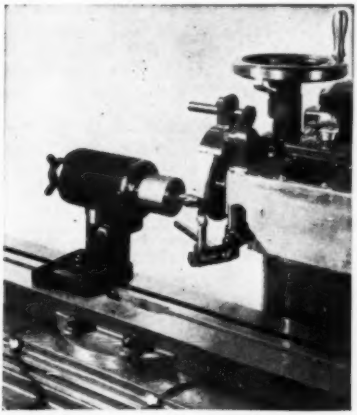
The principle that makes the new illuminating device possible is called "total reflection." "Lucite" rods can be cast with surface smoothness comparable to that of a ground lens. Light rays introduced at any point will reflect through the interior and emerge only where the smooth surface has been interrupted by an embossment.

The industrial instrument sets are being manufactured by the Hitchell Co., Boston and the Emeloid Co., Inc., Arlington, N. J.

Cutter and Tool Grinding Attachments

Two new pieces of auxiliary equipment have been developed by Brown & Sharpe Mfg. Co., Providence, R. I. These are for use with their No. 10 Cutter and Tool Grinding Machine, and their No. 13 Universal and Tool Grinding unit.

They are of particular value in sharpening peripheral teeth of steep spiral end mills having straight or taper shanks. A knob at rear end of attachment spindle facilitates holding the tooth being ground in contact with the



tooth rest while feeding the cutter across the wheel by longitudinal table movement. Mounting of spindle on antifriction bearings provides a sensitive, free-turning unit, of especial advantage when sharpening very small end mills having a steel spiral.

The attachment is carried in a body, which is supported by, and turns horizontally on a base casting. Two zero lines 180° apart assure proper alignment of spindle with table of machine, when sharpening either right or left hand cutters, the base itself being aligned by keys which fit the table T-slot.

End mills having a No. 9 B&S taper

shank fit directly into the attachment spindle, while cutters with other tapers and straight shanks are accommodated by stock collets and adapters available at extra cost.

The illustrations show the No. 10 unit sharpening a left hand spiral cam lock end mill and the sharpening of double end mills in the No. 13 unit, using a spring collet and drawn-in bolt.

Skilled Personnel

A current survey conducted by Ford R. Lamb, Executive Secretary, A. S. T. E. reveals a really serious shortage of tool engineers, as well as skilled tool and die workers and mechanics.

Figures are not complete and Mr. Lamb points out that it is high time a distinction be made between "skilled" mechanics and other types of production labor. He believes there is too much popular confusion between "machine operators" who are only semi-skilled, and the really skilled workers.

He explains that a machine operator can be made out of almost any young fellow who is reasonably handy, in a relatively short period of time, with proper training and schooling. But it takes experience to prepare expert mechanics.

During the past 10 years, we have witnessed the greatest decline in the standards of skill in our industrial plants since the inception of real industrial production in this country. For years, apprentice training was practically at a standstill.

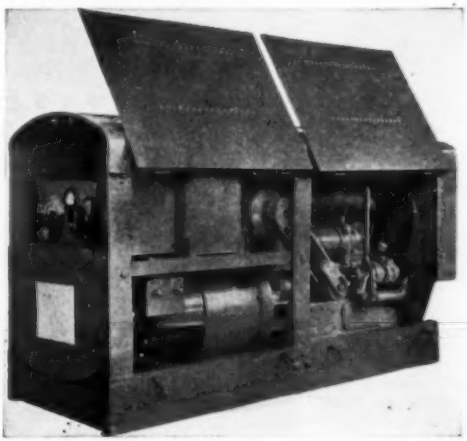
The equipment at many of our vocational schools is so antiquated that the men are learning only the rudiments of "tending" machinery.

"Antiquated lathes that will cut metal at around 50 to 75 feet per minute, may be all right to teach a man what a lathe looks like, in general." "But," says Mr. Lamb, "put him on a modern production machine with modern tooling from which the chips fly at rates up to 400 feet a minute and all you'll get out of him for a while will be a look of blank amazement."

Lincoln Diesel Welder With Gasoline Engine Starting

Gasoline engine starting on diesel driven arc welders, announced previously on a 300-ampere unit by The Lincoln Electric Co., Cleveland, Ohio, is now available on a 400 - ampere model.

This provides easy starting in any weather, along with the inherent diesel economies.



According to field reports quoted by Lincoln, the diesel welder cuts fuel costs 33% to 86%. Total savings run as high as 40 cents per hour. Fuel oil consumption is 1.5 gallons per hour at full-load operation compared with 2.75 gallons of gasoline with conventional engine driven welders.

In addition, the diesel engine compares favorably with gasoline engines in simplicity, weight and cost, as well as operating speed.

The starting engine is a small auxiliary mounted above the diesel. It is hand cranked and a belt drive, clutch-engaged, connects the starting engine to the diesel. Starting in extremely cold weather is facilitated by having the cooling system of the small starting engine connected into the cooling system of the diesel. This permits warming up the diesel by running the starting engine a short time and allowing the heated water to circulate through the diesel engine.

Of 400-ampere capacity, the "Shield Arc SAE" welding generator used on the new diesel welder is equipped with "dual continuous control" and all of the other advanced Lincoln features.

Information on Metal Spraying

Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City, N. Y., announces the first issue of Metco News—a periodical devoted entirely to the latest developments and applications of the metal spraying process. All those actively engaged in the maintenance, salvaging or manufacture of metal products or equipment may obtain copies without cost.

Below The Border

American manufacturers don't have to wait for formation of a trade cartel to begin competing successfully with European countries in South America says Irving Tow, head of the Tonsa chain stores in Argentina and a pioneer in the chain store development of that country.

He believes our manufacturers of radios, electrical appliances, refrigerators, etc., have sufficient business skill to sell their wares to Latin America despite low prices, generous credits and bartering methods that have marked commercial infiltration there by other countries.

Americans can meet this with ingenuity, enterprise and proper application of the vast facilities of mass merchandising now at their disposal. Mr. Tow, who is a native of this country, considers American merchandising methods the most efficient and the most successful in the world. Applying the retailing methods that have made the development of chain stores in the U. S. and Canada "a natural step in the industrial growth of this country," he predicts that North American exports will be increased. Chain store merchandising methods are being developed rapidly in Argentina and other Latin American countries.

The firm Mr. Tow will represent in Buenos Aires has already placed orders in South America for slippers, alligator and snake skin bags, foodstuffs and other products. These will be distributed through stores in the U. S. At the same time he is planning to distribute through stores in South America, some of our typical mass production items, thus creating a two-way traffic. Mr. Tow admits that two-way trade is a real challenge to the ingenuity of American business men, but he has confidence they can meet the challenge.

Jessop Non-Magnetic Steel

A non-magnetic, free machining alloy steel possessing low magnetic permeability with superior mechanical properties has been developed especially for the electrical industry by the Jessop Steel Co., 603 Green St., Washington, Pa.

Jessop non-magnetic steel has a magnetic permeability of only 1.003 to 1.006 at 1000 Oersteds magnetizing force at temperatures from sub-zero to boiling. The illustration shows a piece of electrically magnetized iron at the right and a piece of non-magnetic steel at the left. Note that the lines of force (shown in iron filings) are all directed to iron sample at the right.

Another desirable property of this steel is its high electrical resistance (69 to 71 microhms per centimeter) which considerably produces eddy current lesses.

In the annealed condition, this steel has a tensile strength of 80,000 to 110,000 lbs. per sq. in.; yield poitn. 35,000 to 60,00 lbs.; elongation in 2 inches, 25 to 50%; reduction of area, 30 to 60%; Izod impact value (at room temperature)), 80 ft. lbs.

The steel can be formed readily, welded, machined or blanked. It can be used in transformer, controller and switch covers; entrance plates; spacing bars; end fingers; and numerous other parts of electrical equipment.

Lessons In Welding

Here is a book that's especially helpful for beginners learning to arc weld.

It will also benefit experienced welders desiring the comprehensive practical information presented.

Welding officials, such as supervisors, foremen and instructors will find it a ready reference to fundamental information on arc welding and a guide to its proper application.

"Lessons in Arc Welding" is a series of 51 lessons, based on the experiences of Arthur Madson, Instructor of the Lincoln Arc Welding School, presenting facts and knowledge that will enable the welder to use arc welding processes successfully and economically.

There are four principal sections: —Welding with Unshielded Arc Electrodes; Welding with Shielded Arc Electrodes; Electrodes for Particular Joints and Metals; Hardfacing.

Nineteen lessons comprise the first section, starting with the arc welding machine; its control; striking the arc and running horizontal bead; weaving or movement of electrodes; effect of arc length, amperes and speed on bead, etc.

Nine lessons cover the use of shielded arc electrodes.

Electrodes for particular joints and metals are covered in 15 lessons.

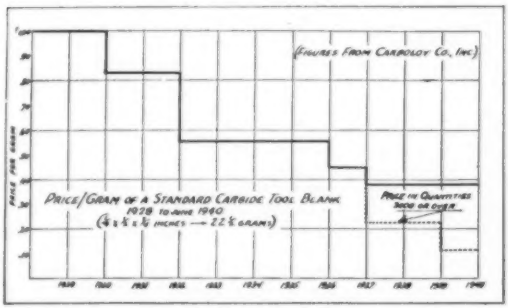
Eight lessons are devoted to hard facing, embracing the building up of steel parts to resist shock, abrasion and impact.

The book may be obtained directly from The Lincoln Electric Co., Cleveland, Ohio. Price is 50c per copy postpaid anywhere in the U. S. A., 75c elsewhere.

It comprises 136 pages. There are numerous drawings and photos.

Carbide Tool Costs Declining

A most striking example of the effect of increased production and demand on costs, is revealed by the accompanying chart showing prices of cemented-carbides for cutting tools over the past 10 years, during which their use has enormously increased — particularly for steel-cutting.



Since 1930, it will be noted, price of a typical standard blank of the metal has dropped over 60 percent (from $1.00 to 38.3c per gram), while "minimum" prices, based on large quantities have declined to almost 1/10 of the 1930 schedule, indicating potential economies available as use of carbides increases. Large increases are anticipated in connection with the current armament program since a major characteristic of the material is to increase output per machine by permitting faster cutting of metals.

There are at present, some 80 producers of carbide cutting tools in the U. S.

Armament

A popular belief that industries like the automotive may be converted overnight to aircraft and armament production has been disputed by A. C. Wickman, Pres., A. C. Wickman, Ltd., a leading British Machinery concern.

In this country to expedite deliveries of special equipment for British armament production, Mr. Wickman revealed it has been found over there that automobile manufacturing equipment is more suitable for the production of trucks, cars, ambulances and vehicles of similar nature. It has not been useful for making shells or airplanes.

Great Britain's armament, five or six years ago, according to Wickman, had declined to probably the poorest peace time state in the country's history. Germany had already been rearming for two or three years.

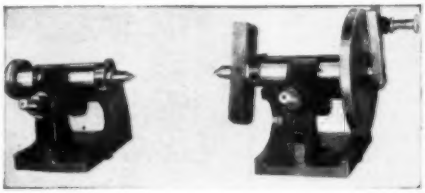
Wickman says that British rearming did not get under way until late in 1935. At that time, he states that 90% of British production equipment was "antiquated." In contrast today, he adds that "not more than 30 to 40% of Britain's industrial machinery is over 10 years' old"—in comparison with the U. S. (something like 70%).

One of the keys to the rapid pickup, Wickman says, was the increasing availability of carbide cutting materials which permitted almost phenomenal increases in production per machine and per man. He was quite surprised that tool manufacturers in the U. S. do not use carbides more extensively. In England as in Germany, the machine tool industry uses carbides 100%.

Hart's Dividing Heads

Rapid, accurate indexing is assured by the dividing heads offered by Hart Machine Co., 26 Mather St., Dorchester, Boston, Mass. The plain dividing head is shown, mounted on 2½" fixtures. Can also be used on 1½" fixtures. Will divide into all numbers up to 16, and even numbers up to 32.

A line of milling fixtures is also offered for holding stock from ⅜" to 5" in size.



Protecting Workers

With the stepping up of production and great increase in the use of welding, protection against dust and fumes become increasingly important.

A full line of such equipment is offered by C. F. Berg & Co., 72 Dedham St., Boston, Mass.

Constructed entirely of metal, Berg equipment is sturdy, yet light and readily portable. The suction duct system shown covers a seven foot radius giving the welder full protection from noxious fumes. Other simple, yet effective setups give protection against dust in grinding and machining operations. Engineering recommendations, based on long experience in the field are offered without obligation.

Profilometer Refinements

The Physicists Research Co., 345 South Main St., Ann Arbor, Mich., manufacturers of the Profilometer, have recently developed two new accessories for use with this instrument which is employed for measurement of surface roughness. A new instrumental modification also extends the practical applications of the Profilometer.

The first of these, known as the Mototrace is an instrument for mechanical operation of the tracer, moved across the surface to be measured. The Mototrace has four specific applications. It is used when the tracer is on very narrow surfaces or small areas where the available tracing distance is only 1/32" to ⅛"—in awkward places near shoulders and holes, where the tracing distance is restricted—on very smooth surfaces (e. g., 1/3 to 2 microinches) where extraneous vibration makes manual tracing difficult—in small holes

or other surfaces measured with the Type I tracer described below. Two motions are provided. The first is a constant speed linear motion, automatically reversing at both ends. Length of stroke is ¼" to 2 1/4", adjustable at both ends. The second motion is a cam-driven constant-speed, quick-reversal reciprocating motion, adjustable from 1/64" to ⅛".

A special tracer, designated as "Type I", has been developed for measuring roughness inside holes as small as ½" diameter. A modification for even smaller holes can also be furnished on special order. The Type I tracer is also useful for measuring the roughness of gear teeth and other difficult-to-reach surfaces. The close spacing of pilot skids of this tracer makes it desirable to use the Mototrace described above for most applications.

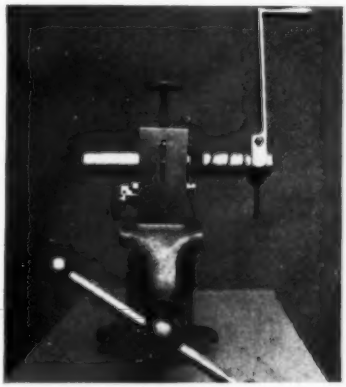
A special Profilometer, with a one microinch scale, can now be furnished when required. The most sensitive scale on the standard Type P Profilometer is three microinches. On especially fine work such as gages, etc., greater sensitivity is required. This special model incorporates an additional point on the range switch, giving three times the sensitivity of the standard model. Except for this modification it is identical in size and appearance with other Profilometers.

Makes Springs in a Jiffy

The problem of providing special springs for special jobs is solved quickly without the use of a lathe, by a line of universal hand spring winders developed by The John Blaner Co., Corner Meek and Elm Sts., Sharon, Pa.

In use, the winders are mounted in a bench vise as shown. A mandrel of the required size (drill rod) is inserted and the top knurled head screw tightened to put tension on mandrel. The spring wire is fed between the two brass washers and attached to crank handle. The nut securing the brass washers is tightened to put tension on the spring wire. Turning the crank handle, the square shaft is adjusted for pitch. Moving square shaft in towards

winder will give a close spring—outwards will wind a compression spring of the required pitch.



Five sizes of winders are available. Mandrel capacity of the No. 1 is from 0 to ½" diameter, handling wire from the finest gauges up to No. 19 (.0359"). Pitch can be adjusted from 0 to ¼".

The No. 4 winder is intended for general factory use, taking mandrels up to 1½" in diameter, and wire up to No. 3 gauge (.229") with pitch adjustments up to 1".

Lee Chip Breaker Grinder

A special machine for the safe and rapid grinding of chip breakers on carbide tools is announced by K. O. Lee & Son Co, Aberdeen, S. D.

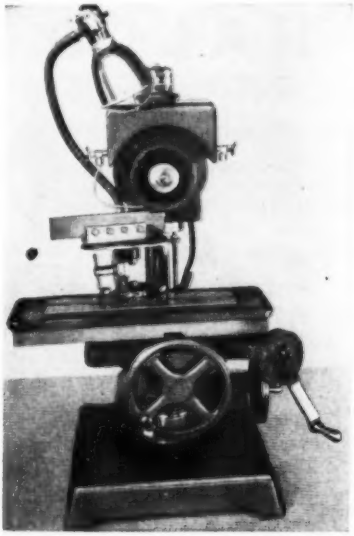
The universal fixture is simple, rigid and quickly set to grind the chip breaker to exact requirements.

Three protactor scales assure accuracy in setting of the tool for side and back rake.

Provision is furnished for supplying coolant to the work.

A vertical feed hand wheel, graduated in thousandths, gives close control.

Power is supplied by a ¼ h. p., 3450 r.p.m., single phase, 60/50 cycle, 110 volt ball bearing, dust proof motor. Motors can be supplied for other electrical characteristics at a slight extra charge.



Motors can be supplied for other electrical characteristics at a slight extra charge.

From Behind the Bars

One of the most unusual inquiries ever received by McKenna Metals Company, has just come from an inmate of a large Eastern state prison. He requested a copy of Kennametal Catalog No. 3, which he had seen advertised.

Since Kennametal is a hard carbide tool material, particularly useful for cutting hardened steel such as used in prison bars, it might be assumed that this particular prospect hoped to use Kennametal to cut his way to freedom. However, the difficulty of preparing a satisfactory tool set-up, together with the fact that his letter passed the censor, indicated that he was interested only in improving the efficiency of the prison machine shop.

Balancing and Metal-Turning Methods

The current release of Gisholt performance data sheets includes case studies in metal-turning using automatic and turret lathes, and a typical example of static-dynamic balancing on a Dynetric balancing machine.

The balancing data covers the procedure followed by a manufacturer of ventilating fans in order to locate, measure and correct unbalance in them. Detailed description of the methods employed for each step is included in the data presented.

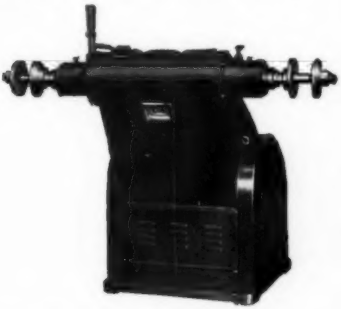
The metal-turning installation stories deal with actual machining procedures followed by manufacturers of automobiles, stokers, and portable compressors using Gisholt turret lathes and automatic lathes. Actual tooling layouts are clearly illustrated for each job. Operation sequences, feeds, speeds and machining times are also given.

This information is contained in performance data sheets Nos. 54 to 57, available from Gisholt Machine Co., 1185 East Washington Ave., Madison, Wis.

Hammond Offers Polishing Lathe

A new addition to the Hammond of Kalamazoo line of Rite-Speed polishing and buffing lathes is the model 10-ROH shown.

It has an "overhanging" spindle, the front section overhanging 12-½" from lower front of base and is especially desirable on large bulky pieces.



Standard Equipment includes spindle lock for holding spindle when changing wheels; combination switch and brake which shuts off motor and instantly stops the revolving spindle; automatic motor starter; up to 10 h.p. motors with multi-v belt drive mounted inside the base.

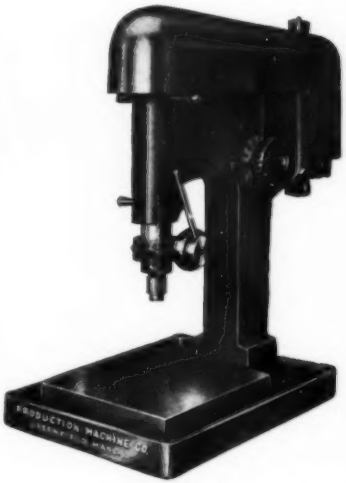
Manufacturers are the Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo, Mich.

Production Sensitive Bench Drills

The Production Machine Co., Greenfield, Mass., announce a new streamline, high speed, sensitive bench drills. It is the latest addition to the half-century old established line of Reed drills.

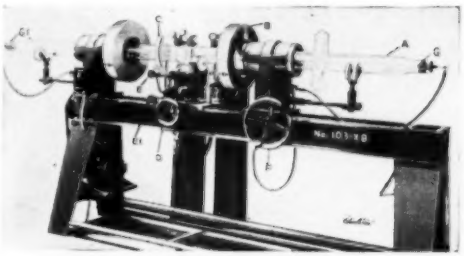
The No. 25 is new in design, strong and simple. It is a production tool for accurate work; an all-purpose machine, capable of unusual speed, and adaptable to a wide variety of drilling operations. The drive is completely enclosed, and the only exposed moving part is the chuck and drill itself.

The variable speed drive provides an infinite spindle speed range of from 2,000 to 10,000 r.p.m., instantly adjustable by the turning of a handwheel, and an indicator shows the running speed at all times.



Capacity—center-spindle to column is 7". Max. distance—chuck nose to table is 6-3/16". Range adjustment of sliding head is 3". Travel of spindle with depth stop, 3". Travel of spindle without depth stop, 3-¾". Working surface of table, 11" x 11". Motor, ½ h.p., 110 volt, 1 phase, 60 cycle 3450 r.p.m., G. E. Co. Drill sizes, No. 70 to ¼". Spindle dia.—least, 7/16". Spindle sleeve diameter, 2-⅛". Spindle quill diameter, 1-⅝". Spindle material, Rytenn A.A. Chuck-nose range, 6". Chuck capacity—Jacobs' No. 7-1A. 0 to ¼". Spindle bearings—2 sealed precision ball bearings. Spindle pulley is of floating design and provided with 2 sealed, precision ball bearings. Height overall, 27". Bench space, 15" x 32-¼". Weight with motor—195 lbs.

Eisler Glass Working Lathe

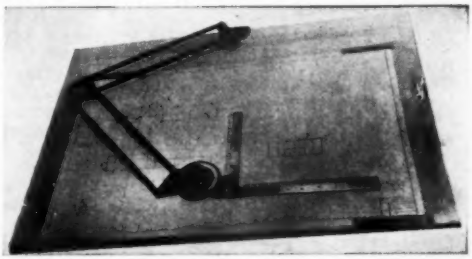


The Eisler Engineering Co., 762 South 13th St., Newark, N. J., has developed a horizontal butt sealing and general glass working lathe, No. 103-XB.

This type of machine is employed extensively for the production of large electronic tubes where metal and glass have to be sealed together. The machine will take tubing up to 6" in diameter and can be supplied for larger sizes. A great many operations can be performed on this machine, some of which are:—1. Flare making. 2. Stem making. 3. Butt sealing. 4. "T" sealing. 5. Glass piercing. 6. Sealing metal to glass. 7. Drawing and shaping of glass.

Butt sealing is done by a series of flames, of a circular shape, using air and gas or at times oxygen and hydrogen, depending on the nature of the glass. Machine is equipped to work hard and soft glass and can be supplied in many types and sizes, either horizontal or vertical. A 1/3 h. p. motor is required. The swing over bed can be from 12" to 36". The bed can be had in 4—6—8—10 or 12 ft. lengths.

Wrigraph Industro Drafter



A new, completely adjustable ball-bearing drafting machine for drawings up to 24" x 36" is offered by L. G. Wright, Inc., 5209 Euclid Ave., Cleveland, under the trade name of Wrigraph Industro Drafter.

It is a precision instrument which can be clamped to any drawing board up to 2" thick and 36" wide. Extension clamps are available for mounting on wider drawing boards. A hinged mounting, permits raising clear of the board. A leveling screw adjusts to the plane of the board.

Eccentric adjustments provide for calibration and control of accuracy.

The arms are of specially rolled channel steel, giving extreme rigidity. All steel parts are finished in black baked wrinkle enamel. Eight hardened ball-bearing assemblies are adjustable.

Protractor head is controlled with the left hand and a new design features a No-Set-Zero. A one-half degree vernier, equipped with a magnifier, provides for quick and accurate setting of all angles.

Standard transparent edge engine divided scales are available in all standard graduations. These unusual scales are designed in such a way that they touch the drawing paper at the front and rear edges only. A thin square drawing edge on the scale makes it possible to use either pen or pencil.

Leisure Time and Home Safety

When your men leave the plant at night, what assurance do you have that you will greet them in the morning? One large firm has compiled statistics which indicate that the greatest danger

lurks not where they work, but on the highways where they walk or ride during leisure time. In a 10-year period, a total of 39 employees met death from occupational causes. In the same period, 112 employees were killed on the highways.

A few minutes spent discussing after work accidents is decidedly worth while. Management should be concerned with the safety of their employees after the "whistle blows" as well as while they are at work. It costs money to train employees and relief workers generally are less efficient.

In connection with the subject of leisure time safety, the seriousness of the home accident problem must not be forgotten. Fatalities in the home increased 2 per cent last year over the experience for 1938—from 31,500 to 32,000. When you realize approximately the same number of persons met death in their homes as were killed by automobiles, then you can well appreciate the need for drastic action.

Why not take immediate steps to impress your employees with the seriousness of the problem and to provide them with training which will tend to reduce the probability of injury or death?—(National Safety Council, Inc.)

Cone-Drive Worm Gear Sales Soar

An increase of 400 percent in shipments of Cone-Drive worm gearing for the second quarter of 1940 as compared with the corresponding period of 1939, is reported by Cone Drive Division, Michigan Tool Co., Detroit.

The total represents an increase of roughly 200% over the first quarter of this year, which in turn had shown a gain of 94% over the first quarter of 1939. Totals do not include production of Cone-Drive gearing manufactured for sale or use in their own products by Michigan Tool Co, licensees.

Despite the large increase in production and shipments, unfilled orders for this type of gearing reached a new high, approximately three times total Cone-Drive sales for the entire year of 1939. A new plant is at the present time under construction which will double production capacity for this form of gearing.

Gorton Boring Bar Sets

Rapid adjustment of tool (in and out) by screw graduated in thousandths—positive wedge locking of cutting tool — wide adjustment range — rugged bar, well supported cutting tool —low cost cutting tools, easily replaced — these are the highlights claimed for the Gorton - Wetmore Precision Boring Bars offered by George Gorton Machine Co., 1115 13th St., Racine, Wis.

All bars are furnished with high speed steel cutting tools and have No. 9 or No. 10 B & S taper shanks, fitting 8½D and 9J Gorton super speed millers, respectively.

Boring bar sets are offered, as shown, consisting of four bars and one No. 6 Flynn micrometer boring head, providing a complete range of tools for holes up to 2" in diameter.

Model "F" Whiteprint Machine

A new fast-printing whiteprint machine in the medium price class has been developed by the Ozalid Corp., Johnson City, N. Y. It has been built to serve a vast market for which printers equipped with low pressure mercury vapor lamps are too small and high speed reproduction machines such as, arc lamp printers, are too expensive and too fast.

It comprises all the facilities necessary to produce finished dry-developed Ozalid whiteprints in less than two minutes. Yet, it is said to require less than 14 square feet of floor space and use less than half as much electrical energy as other type printers of equal capacity.

A new type high pressure mercury vapor lamp with an output of 40 watts per inch and an active length of 46", gives printing speeds ranging up to 56" per minute with uniform light distribution. Lamp is guaranteed for 1,000 hours. Past performance indicates a possible life of 1500 to 2500 hours.

Original and sensitized materials are held in contact with a 4¼" diameter glass cylinder which revolves around

the stationary lamp. Cylinder, tracing and sensitized material revolve at the same rate of speed so there is no slippage, friction or static.

An adjustable light shade permits operator to vary exposure without changing rate of printing speed.

The Model "F" is driven by a resiliently-mounted split phase ¼h.p. motor. Developer is driven by motor through a specially designed 50-1 reduction gear and the printer through a friction disc type, variable speed transmission providing printing speeds between 4" and 56" per minute.

A special reactive type transformer equipped with condensers provides power factor correction to 87.5%. On terminal board of transformer are 12 taps which permits adjustments for line voltage variations between 200 - 240 volts.

Precision Tool Work Benches

A complete line of work benches for tool room use is offered by J. H. Rosberg Mfg. Co., 650 N. Kedzie Ave., Chicago, Ill.

Sturdy in construction and reasonable in price, these benches provide ample drawer capacity for small precision tools. Tops can be linoleum covered at a slight extra charge. Finishes can be in walnut, mahogany or oak.

Special work benches and special drawer arrangements will be made up to any required specifications.

Man-Power

Health in industry is a more vital consideration because of the present emphasis on armament.

Strong minds and strong bodies are needed to carry on the nation's defense measures.

At a recent conference, Dr. Victor G. Heiser explained that physical fitness of the Nazi war machine did not stop in the military ranks, but reached to the vital supply sources—the industrial machine.

Says Dr. Heiser, "It is the industrial machine to which America is looking for effective national defense. This machine is being called upon to build a defense which all hope will make America secure from the ravages of war.

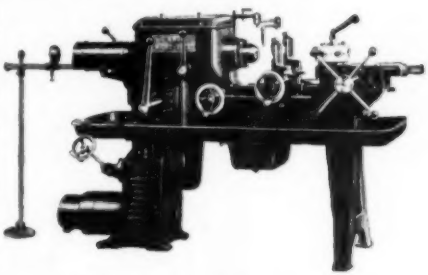
Dr. Heiser visited Germany about the time Hitler came into power. To his dismay, he found that the finest medical minds had been replaced in the Nazi regime with quacks, fadists and radicals—good Hitler supporters.

On a second visit, two years later, he was amazed to find that the quacks and crackpots had been kicked out and reputable medical scientists were again directing Nazi health. The program was a simple one, calling for periodic physical checkups of every person engaged in rearmament. It took in all the men and women doing physical work in the factories building war equipment. Those found to be physically unfit were taken off the job until health could be restored—or if the disability was found to be permanent, until less arduous work could be found.

Simmons Micro-Speed Turret Screw Machine

A new No. 2 (1¼") turret screw machine is presented by Simmons Machine Tool Corp., 1725 Broadway, Albany, N. Y.

It features a Micro-Speed drive which is said to provide a thousand spindle speeds, enabling the operator to select immediately, the speed best suited for the spindle, dependent on the class of stock being machined.



This novel drive unit is built into the cabinet leg. A turn of the hand wheel provides an infinite range of spindle speeds. A 3 h. p., motor is built-in and may be had for any required electrical characteristics.

The spindle is mounted on Timken precision tapered roller bearings. Bearings for sliding members are accurately hand scraped. Head is cast integral with bed for rigidity.

A long lever is provided on headstock for operating automatic chuck and bar feed. Extra collets can be furnished for holding short length work of greater diameter than capacity through spindle. Each position of turret is controlled by independent adjustable stops. The hexagon turret holds six tools, with or without shanks. Bolt holes are provided for securing tools to faces of turret.

Cut-off is lever operated, although screw feed can be furnished. Two tool

posts of different heights are furnished. A geared oil pump provides lubricant through adjustable piping system to the work.

Swing over bed is 14"; over cross slide 6". Width of bed is 7". Automatic chuck capacity, round, is 1"; square, 11/16"; hexagon, ⅞"; hole in plunger is 1-1/32". An oversize spindle can be supplied (at additional cost) to provide automatic chucking capacity for 1¼" round, with 1-5/32" hole in plunger and 1½ hole through spindle. Cross slide travel is 5"; hand longitudinal travel 12". Maximum distance, spindle to turret face is 18". Power feeds per revolution of spindle, .006", .010" and .018".

Foley DM-3 Die Maker

A universal precision sawing and filing machine, designed especially for die work is offered by Foley Mfg. Co., 28 Main St., N. E., Minneapolis, Minn.

The makers emphasize that large starting holes are not required. Only the smallest hole through which saw or file passes is necessary. It is asserted that properly annealed die steels (high carbon, high chrome and high speed) regardless of toughness, can be sawed.

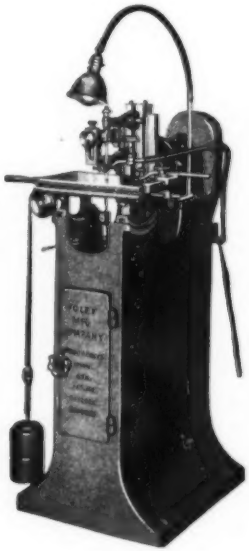
Any type from the coarsest to the finest high speed saw can be used without changing holding fixtures. Chucks are constructed to hold any blade, and no holes in blades are necessary. Standard and special files, from the finest needle file to the coarsest can be used without special holding fixtures.

Angular changes in table position can be made quickly without wrenches or tools. Ram can be tilted right or left to any desired angle up to 20°. In combination with the adjustable table, it permits cutting at combination angles.

Hold-down is combined with air nozzle and provides an air blast from internal air pump, keeping the work clean.

The 6-⅜" throat permits sawing to

the center of 12¾" piece and 3" thick steel can be handled. Table is 9" x 14" and tilts 20° front, 10° back. It is 41¾" from floor. 4" to 10" saws, and



4" to 14" files and stones may be used. Power feed is 12" blade and feed finger. Stroke adjustment is 0 to 4". Five step pulley provides range of 85, 125, 175, 235 and 400 strokes per minute.

Continuous A.C. Arc Welders

Ergolyte welders, made by Ergolyte Mfg. Co., of 3644 Lawrence St., Philadelphia, offer new conveniences. All controls and sockets have been brought into full view on a sloped panel. Heats may be selected in gradual steps over a wide range, correctly proportioned to correspond to the commercial gauges of metal handled. Insulation is double spun glass.

A broken wave current is employed, produced by a special winding which is designed primarily for stability and quiet operation.

It is claimed that the current required at no load never exceeds 50 watts. There are two models, No. 160 with a current range of 15-160 amperes and No. 250 with a current range of 15-250 amperes. Ergolyte welders operate on single phase or one phase of 2 or 3 phase current.

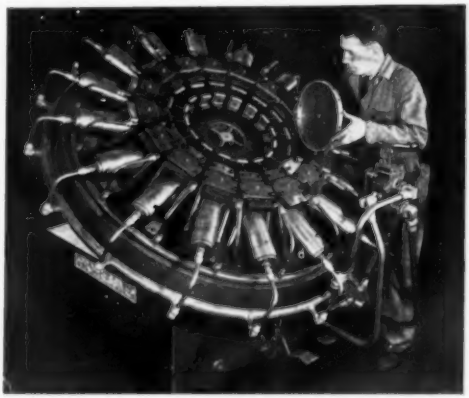
Steel Selection Chart

A new chart giving brands of Jessop tool steels recommended for various tools, dies and other applications, is offered by Jessop Steel Co., 603 Green St., Washington, Pa.

Known as the Jessop tool steel recommendation chart, it lists over 150 applications in alphabetical order, with the recommended tool steels indicated at the right of each application. It is easy to locate the tool or die under consideration from the alphabetical list of applications, then quickly determine what tool steel to use in the vertical columns at the right. Two different symbols are used to identify the tool steels recommended: — One indicates recommendations for average runs, the other for long runs.

Hydraulic Fixture Punches 16 Holes

High production speed, flexibility of individual punching units to permit rearrangement to accommodate possible changes in work, initial low cost—due to elimination of costly cam dies and constant air pressure method of piston return are features of a new series of self-contained hydraulic punching units announced by Progressive Welder Co., 3019 East Outer Drive, Detroit, Mich.



Constant air pressure is maintained in the piston return chamber. During punching stroke, this pressure is overcome by hydraulic pressure obtained through a hydraulic pump. Release of hydraulic pressure permits air pressure to return the piston, thus eliminating spring return. mounted on a radial type fixture designed to punch 16 holes simultaneously A group of the new units are shown,

in a harvester beater cover disk of ⅛" steel. The fixture is provided with a foot actuated work ejector. Automatic work locators are attached to the spring stripping plates which hold the part firmly in position during punching.

After part is placed on die, opening of a three-way control valve initiates the punching operation by admitting oil, under pressure from hydraulic pump, to individual punching units. As all punches move in, locators hold work in position for punching. Immediately punching is completed, operator opens control valve permitting oil to by-pass back to reservoir in base. As stripping is completed, air in piston return chamber, under ordinary factory line pressure, moves piston back to starting position.

Bending Angle Iron Circles

An angle iron circular bending machine, No. 14, is offered by Excelsior

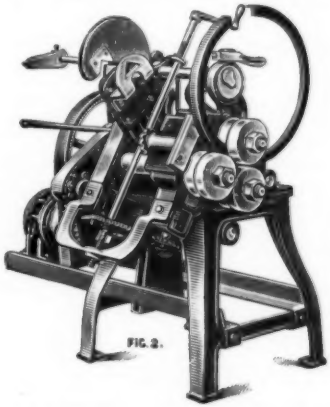


FIG. 2.

Tool & Machine Co., East St. Louis, Mo. It is designed to cut to length and bend 1¾" x ¼" angle iron to a true circle. Also ½" x 4" bar iron and 2" tee iron (and smaller) can be formed with the same rolls which are adjustable to various requirements. Special rolls for pipe, channel iron or any shape within the capacity of the machine can be furnished to order.

All three rolls are driven and small circles can be rolled by one pass with ends close together. Reversing the angles and passing them through twice, both ends will be true to the circle.

A friction clutch permits starting and stopping under pressure. Frames are of semi-steel. Rolls are of forged hardened tool steel, driven by heavy chain gears, 14:1 ratio. Shafts are 3" in diameter; rolls 7" x 2" face, operating at 15 r. p. m. or 25 lineal feet per minute. Power required, 3 h.p.

Pilot Cylindrical Plug Gages

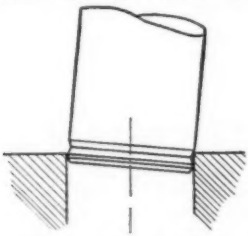
A definite advance in plug gaging is offered by Pratt & Whitney in the new Pilot principle. Instead of being difficult to start, it is asserted that this

new plug gage can be presented lightly at an angle and almost falls in by itself. A combination of a chamfer at the end and an annular groove near the end permits easy entry and the gage centralizes itself, lines up and enters without jamming. Even when the plug is a very close fit, it is claimed to slide in without difficulty—and large gages are said to work as easily as small ones.

The advantages of such gages are ob-

vious, in the hands of unskilled operators—or when the hole being gaged is difficult of access.

Another attractive feature of P&W



plug gages is the machine lapping which levels the surface hills and valleys and provides a large effective area of gaging surface to take the wear in every day use.

Pilot gages are produced by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., under a direct license from the British originators. They are prepared to incorporate the Pilot principle in existing square end plug gages where desired.

Wyco Concrete Vibrator

A new model, gasoline engine driven, wheelbarrow mounted concrete vibrator has been developed by Wyzenbeek & Staff, Inc., 836 West Hubbard St., Chicago. It features a simplified clutch mechanism and a rugged flexible shaft construction with a non-metallic inner liner. Power loss in the shaft is claimed to be low, permitting the use of four or five sections.

The vibrator head is of the unbalanced rotor type. It is a one-piece alloy steel casting, mounted on two Norma-Hoffman roller bearings with one ball thrust bearing.

Vibrators of this type are used to assist in settling the concrete properly, eliminating cavities and honeycombing, and assuring proper bond with the reinforcing bars.

Rubber Dies in Aircraft Work

Huge slabs of rubber weighing two tons each are reported to have helped step-up aircraft production at the Douglas plant.

The slabs are 13′ long, 5′ wide and 11″ thick and were made by Goodyear. They are used in three 5000-ton presses in the making of metal stampings.

With this rubber mat process, a single die is used. The rubber fits into a steel container which descends on the press table. The metal is placed over the die, and as pressure is exerted, the rubber conforms to the shape of the die and forces the sheet metal into the desired form. The rubber flattens out when pressure is applied until a spectator would think it could never return to its original shape,—but it always does.

An advantage of the process lies in the elimination of burrs and sharp edges, saving a lot of burnishing and buffing. Then there is a real saving in the matter of dies, for only one die has to be made, and it can be of wood instead of steel. To resist the cutting action of the dies, a rubber compound of great strength is required, with extreme toughness and lots of ability to stretch.

While the process is especially adapted to the aviation industry, where die costs have been extremely high due to limited production, it is believed the

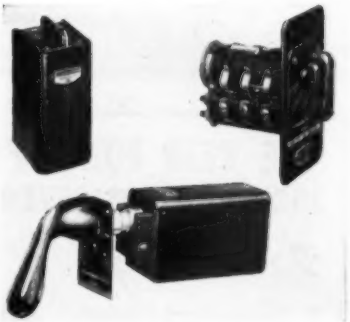
method may be used to some extent for automotive stampings.

The process is said to be particularly effective with light and flexible metals such as aluminum and its alloys. The Douglas Co., also uses the rubber stamping for shearing metals by sharpening the edge of the die. Light metals can be sheared clean and it is said that high test carbon steel can also be processed.

Blanking and forming operations are performed simultaneously and it is reported that Douglas Aircraft has licensed the process to a number of other manufacturers.

Drum Type Master Switch

A new drum type master switch providing 3-wire control for machine tools and other equipment is announced by Cutler-Hammer, Inc., Milwaukee, Wis.



It is claimed to afford functions equivalent to two and three button heavy duty push button stations and is offered for use where an operating lever is preferred.

Three types are available: — surface, cavity, and panel mounting—and two kinds of handles, standard and pistol grip. By removing a stop post, the drum may be converted from non-reversing to reversing.

Ratings of the new drum type master switch are for pilot circuits up to 600 volts A. C. and D. C., and details are given in bulletin 10260.

Varidrive-Syncrogear Units

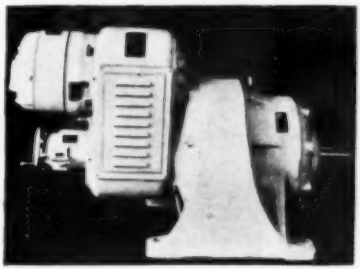
Providing more compact and smaller units, U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Cal. and 80-34th St., Brooklyn, N. Y., have added types VEV-GD and EV-GT to the Varidrive line. These are of the Varidrive speed design with the double reduction and triple reduction gears for low speed drives.

The new construction does not require a sub base for mounting as a unit and consequently is lighter and more compact.

Further modification of the old design permits mounting of the Varidrive case at any angle with respect to the gear case. If the unit is to be mounted where head room is low, the case may be placed on its side or at any convenient angle.

The pyramidal gear pedestal is characteristic of U. S. Syncrogear motors, providing a rigid mounting for the case and a sturdy motor capable of withstanding heavy torsional stress resulting from heavy loads at low speeds.

The tooth surfaces of gears are hardened to 55/65 Scleroscope, providing a high standard of surface hardness



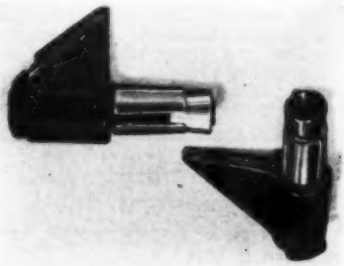
which means longer life. The core or inner body of the pinions is extremely tough and of proper ductility for maximum resistance to fatigue from recurring shock stress.

Rawlplug Wall Anchors

Among the innovations at Parkchester (Manhattan's largest apartment

development) is a new type of valveless loop-fed convection radiation, thermostatically controlled.

The enclosed radiators were attached to the rough brick walls by a newly



designed expansion anchor made by The Rawlplug Co., Inc., 98 Lafayette St., New York City.

This anchor is designed to expand with a true radial expansion, engaging the masonry more accurately than caulked lead. It is simply driven into a hole with a hammer.

It involves a combination of a circular sleeve with one continuous slot and a taper inside of the sleeve, exactly complementary to the taper on the outside of a threaded cone. Installed in one piece, it is driven with a hammer telescoping the anchor, locking it in the hole in the masonry. Final expansion of the anchor takes place with a few turns of the bolt firmly attaching the bracket to the wall.

Electrical Coil Bobbins

A new type of electric coil bobbin has been developed by Precision Paper Tube Co., 2033 Charleston St., Chicago, Ill., that enables manufacturers of small motors, relays, solenoids, reactors, photo electric devices and other electrically actuated equipment to use smaller and more efficient bobbin coils rather than the larger layer-wound coil, having insulating strips between winding layers.

The new bobbins are of Kraft or Fish

paper, or a combination of both, depending on requirements. The paper is spirally wound on a steel die on automatic machines to form tubes of convenient length, which are cut into proper bobbin sizes. The flanges are of vulcanized fibre, die cut to exact size and shape and pressed over ends of tubes. Ends of the tubes are swaged. Impregnating the bobbins with a special lacquer increases the strength and forms a seal between tube and flange and improves electrical characteristics.

Drive Fittings and Accessories

A very complete line of pulleys, V - belts, flanged and crown face pulleys, variable pitch pulleys, flexible and sleeve couplings, pillow blocks, journal bearings, shaft collars and supports is illustrated and described in a new catalog No. 42 issued by Chicago Die Casting Mfg. Co., 2502 W. Monroe St., Chicago, Ill.

An interesting line of grinding mandrels is presented, along with saw, buffing and grinding mandrels.

Die cast flanges, hubs and hand wheels are included, together with grinding and motor attachments, universal joints, reducing and mitre gears, sanding discs and revolving display tables.

Skilsaw Announces New Disc Sanders

Three new disc sanders are announced added by Skilsaw, Inc., 5035 Elston Ave., Chicago, Ill.

Model "SP" is a 2-speed heavy duty sander and polisher—especially developed for steady use in metal fabricating plants where there is need for a variety of sanding, polishing and buffing operations. When operating at a speed

of 4200 r.p.m. with a 7" disc, it provides a maximum of sanding efficiency.

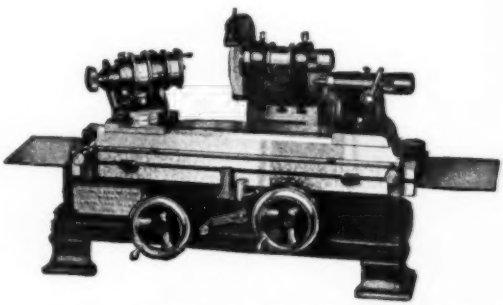
At 1300 r.p.m., the tool is used with felt rubbing pads or lamb's wool polishing bonnets for rubbing down lacquered surfaces and other polishing operations. A simple gear shift facilitates changing from one speed to the other.

Eight heavy duty ball bearings, on all shafts permit maximum loads and with quiet operation and long life. Model "SP" is 18½" long and weighs 14-¾ lbs.

Model "H2" (illustrated) is a 2-speed heavy duty sander for real economy wherever sanding work is constant in nature. A 9" disc is first used at 2700 r.p.m. When outer edge of disc becomes worn, it is re-sized to 7" diameter using a special disc trimmer provided. Mounted on the alternate 7" pad, it is used at a speed of 4200 r.p.m. Eight heavy duty ball bearings, on all shafts make for efficiency and longer life. Model "H2" is 19½" long and weighs 16 lbs.

Model "SL" is an extra heavy power unit for a wide variety of heavy duty sanding, grinding and surfacing. It operates at a no-load speed of 5000 r.p.m. which is the speed recommended by grinding wheel manufacturers for 6" wheels to insure fastest production and longest life.

Crystal Lake Universal Grinder



A sturdy universal bench grinder, for production, tool and experimental work is offered by Crystal Lake Machine Works, Crystal Lake, Ill.

It handles a wide range of work including three angles in one setting for circular tools; internal and external for dies, gauges, square, hex, spline, punch, cam grinding; index for accurate grinding; precision grinding of screws, rollers, cam shafts, parts of cameras and projectors, airplane engine parts, instruments, etc.; cutters, form tools, concentric ground reamers, etc.

Platen swings through a complete graduated circle, clamp loosened or tightened from either side. Two speeds are available for platen feed for wheel —.037" and .300" per turn of hand wheel —micrometer stop on platen for positive sizing—.0001" direct reading on dial. 6" x ⅜" wheels with ⅞" hole.

Table is 27" long—capacity 8" x 10"; triple geared, travels ½" to one turn of hand wheel. Platen is of Vee and flat design for sustained alignment of

head and tailstock. Sensitive adjustment of platen is provided for tapers.

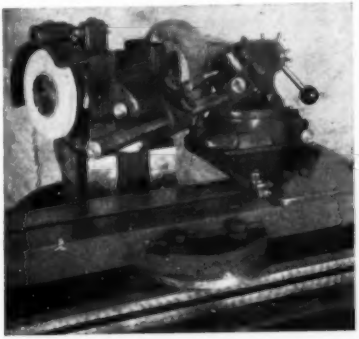
Tailstock spindle is hard-ground and lapped for accurate grinding on centers.

Headstock is swivel graduated to full circle, hard-ground and lapped. ½" maximum collet capacity—9/16" clear hole through spindle. Four changes of work speed are provided. Swings 4" over platen.

Internal grinding attachment, operating at 17,500 r.p.m., and a spline grinding attachment running at 5600 r.p.m., are available.

Covel Tap Grinding Attachment

A wide variety of sizes and styles of taps can be chamfer sharpened on the new No. 2 tap grinding attachment offered by Covel Mfg. Co., Benton Harbor, Mich.



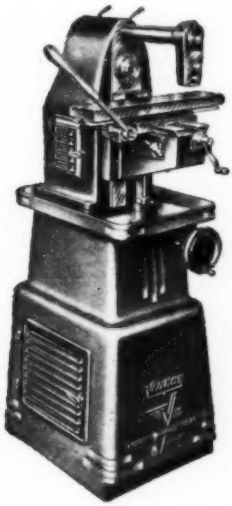
It is easily mounted on any grinding machine equipped with a grinding wheel of 1¼" face or less, longitudinal and transverse adjustments similar to a universal cutter and tool grinder with a flat table 4½" to 6½" wide.

Set up is simple. No cams, gears or collets are required to hold the taps, or to obtain the proper eccentric relief.

Small taps from No. 6 to 6½" are held in an accurate 3-jaw chuck, while larger taps are held on centers during the grinding operation. A female center is provided for the small taps requiring it. Capacity embraces No. 6 to 2" diameter taps, any pitch, from 1" to 12" long—2, 3 or 4 flutes, right or left hand.

The New Vernon Hand Miller

A new addition to the Vernon line of precision milling machines is the Vernon No. 0 hand miller for high speed milling of smaller parts. With hand lever operated rack and pinion feed,



the Vernon No. 0 is a precision machine tool providing the accuracy and sturdiness required for the modern production department.

Two standard speed ranges are available:—100 to 1000 r.p.m., or 150 to 1500 r.p.m. The fully enclosed variable drive operating in these speed ranges provides correct spindle speeds for a broad range of jobs. The ground spindle of heat-treated steel is mounted on Timken tapered roller bearings. The taper in the spindles is No. 9 B. & S. Power is provided by a ½ h. p., 1750 r.p.m. 60 cycle motor. For continuous high speed operation a ¾ h. p. motor is recommended. Net weight is approximately 650 pounds and the overall weight is 58". It is made by the Machinery Mfg. Co., 3636 Irving St., Vernon, Los Angeles, Cal.

Portable Rectifier For Test Bench

The Model SP-20 rectifier, manufactured by Mellaphone Corp., Rochester, N. Y. is designed especially to provide d. c. from an a. c. source for testing purposes. The output voltage may be adjusted by means of knobs on the

front panel in steps of 32, 110, 115, 120, 210, 225, 240 volts. Output voltage is indicated on panel voltmeter.

Maximum current capacity is given as 30 amperes at 32 volts d. c. and 20 amperes at other voltages. This provides ample power for testing farm equipment as well as 110 or 220 volt d. c. refrigeration equipment, business machines, electro-magnetic devices etc.

Two mercury vapor tubes are used to obtain full wave rectification of the single phase a. c. line. Output voltage remains practically constant from no load to 25% overload.

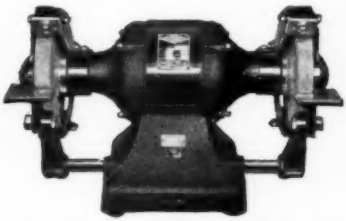
The Model SP-20 can be supplied either with or without a filter choke. For ordinary purposes filtering is not necessary. However, where it is desired to duplicate d.c. line conditions, the filter should be used.

A Hinged cover provides easy access to the tubes and terminal strip. Wheels can be installed for extreme portability. Size 12" x 12" x 21" without filter; 12" x 18" x 21" with filter.

Mechanics Through the Ages

Thor Announces Bench Grinders

Substantially built for all-around service in grinding, buffing and wire wheel work, three new Thor electric bench grinders are announced by the Independent Pneumatic Tool Co., 612 W. Jackson Blvd., Chicago, Ill.



The three sizes: — 6" light duty (B-66), 6" heavy duty (B-6), and 7" heavy duty (B-7)—have motors completely enclosed, cool, quiet running and free from vibration. The ball bearings are oversize, dust tight and require greasing attention only once a year.

All sizes are provided with adjustable tool rests, arranged so that safety glass eye shields can be attached. The wheel guards are extra heavy and on sizes B-6 & B-7 are of the enclosed type with chutes.

The size B-66 and the B-6 are of the split-phase start, induction-run type and the B-7 is of the capacitor-start, capacitor-run type, with oil-filled condenser in base. The latter, having no centrifugal starting switch, commutator or brushes, is adapted for heavy duty service.

Interstate Combines Offices and Warehouse

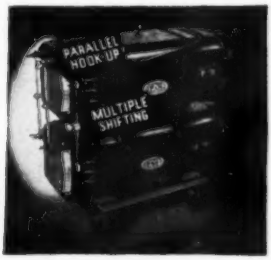
Interstate Machinery Co., Inc., have moved general offices to their large warehouse at 1431 West Pershing Road, Chicago. The new telephone number will be Yards 5800. The attractive new offices are shown.

The move was made after a careful survey showed clearly that in combining offices and warehouse, they would have improved facilities to handle inquiries and orders more promptly. They will continue to maintain their downtown branch at 109 South Clinton St., Chicago. It is only a 15 minute run to the warehouse and free transportation is provided.

A new catalog, No. 404 contains descriptions of the large stock of new, used and rebuilt machinery for metal fabricating, structural steel, sheet metal, production machinery, and machine tools. It is completely indexed, has over 200 illustrations. Over 2000 machines are carried in stock.

P&H—Hansen Square Frame Welders

An unusually compact and easily portable welder is offered by Harnischfeger Corp., 4578 W. National Ave., Milwaukee, Wis.



Less than a yard long and a foot high, it is said to give the required arc characteristics all the way up and down the range—from 200 down to 15 amperes. Equipped with single current control, there is only one indicator to set. Response is said to be automatic for the desired arc length, under all conditions.

An especially desirable feature is the provision for "stacking" the welders and operating two or more in parallel for high amperage requirements—or the units can be operated individually for the ordinary run of work—providing two separate 200-ampere services for two welding operators. When used in parallel hookups, connections are made with simple paralleling elements and the multiple shifter sets current on both machines at once. Bulletin W-28 describes the equipment in detail. Bulletin W-26 covers the square frame welder with a range from 260 down to 30 amperes.

Double-Floating Box-Type Safety Holder

This Holder is designed for faster and more efficient marking on hot, cold, flat, round, or angular surfaces. It will work equally well whether the

surface to be marked is rough sheared, sawed, or ground.

The holder is constructed with a sleeve which levels or holds the "floating" type holder at right angles on the surface to be marked. The steel type also "float" within the type holder. Because both holder and type are held loosely, a double leveling action takes place when the holder is struck with a hammer.

The holder and type are made from patented safety steel which it is claimed will not spall or mushroom.

The maker is M. E. Cunningham Co., 1115 E. Carson St., Pittsburgh, Pa.

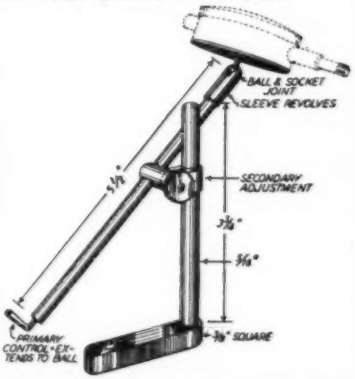
Red-E-Set Dial Gage Holder

A new adjustable dial gage holder with universal ball joint and remote control, for all makes of dial gages is offered by the Red-E-Set Company, 513 Fiske Bldg., Boston, Mass.

The ball and socket mounting is claimed to enable gage contact point to touch almost any spot on a spherical surface with only one adjustment.

The primary adjustment is said to handle 90% of the setting. It is easily

accessible, 5½" from the work. A secondary adjusting clamp device serves for rough placing of the gage.



No springs are used in the device and the tubular construction assures rigidity. With a 2" disc for the gage mounting, weight is said to be under 7 oz.

G-E Geared-Type Limit Switch

A new, small-size geared-type limit switch is announced by General Electric for application to motor-driven devices where it is necessary to limit the rotation of the motor shaft or some rotating shaft or gear on the driven machine. Such devices include automatically operated devices, and certain types of machine tools. The switch is compact, measuring 4-11/16" x 3-½" x 1-29/32".

In use, the shaft of the switch (which is usually directly connected to an electric motor) serves as a driving gear, causing the pinion shaft to turn. The pinion shaft engages the driving gears which move along the drive screw toward one of the operating gears at either end, depending on the way they are turned by rotation of the pinion shaft. For one adjustment, the traveling gears maintain a constant space between them.

At the end of travel in either direction, a pin on the traveling gear engages a pin on the operating gear. This causes the operating gear, cam, and safety pin, which are a unit, to rotate and move the switch contact arm to a high part of the cam, operating the contacts. These contacts are designed for 125-volt, 4-ampere a-c operation and 125-volt, 1-ampere d-c operation.

Boice-Crane Expands Line

The Boice-Crane Co., 1729 Norwood Ave., Toledo, Ohio, are now manufacturing several new models of their ⅝" capacity "Helmet-Head" drill presses with completely enclosed drive.

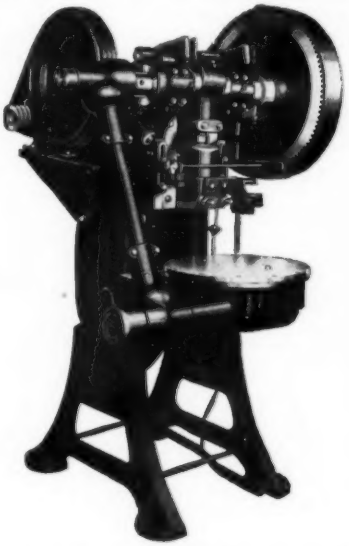
Models added include single and multiple spindle floor types; Morse taper spindle types; a complete range of slow-speed models (5 speeds from 425 to 3340 r.p.m.) in single and multiple bench floor types.

Several high speed tapping machines have been added to the "Helmet-Head" line. Also, separate drill press heads, columns and column flanges are now available for building up low-cost, special drilling, reaming and tapping tools.

Complete details are given in a new bulletin.

Federal Dial Feed Press

A special auxiliary safety stop prevents damage to dies in case of a jam. The design of the press permits an exceptionally wide range of tooling. The indexing system is built into the standard Federal chassis. The exclusive design of Federal cams assures positive indexing and locking mechanism with smooth action. With Federal automatic loading and ejecting mechanism, it is claimed a production of from 9,000 to 10,000 units per hour can be accomplished. The presses are furnished



either with or without the automatic loading and ejecting feature by Federal Press Co., Elkhart, Ind.

Eliminating "Wet Air" Troubles

The Aridifier, made by the Logan Engineering Co., 4916 Lawrence Ave., Chicago, is claimed to eliminate troubles arising from moisture, oil, dirt and scale in compressed air lines.

This unit, encircled in the picture,

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- ☐ Belts, V Type
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- ☐ Bending Machines, angle iron
- ☐ Bending Machines, hydro
- ☐ Bending Machines, pipe
- ☐ Bending Rolls
- ☐ Blocks, chain
- ☐ Blowers
- ☐ Blueprint Machy.
- ☐ Bolt & Nut Machy.
- ☐ Boring Heads
- ☐ Boring, drill. Machy.
- ☐ Boring & Turn. Mills
- ☐ Boring Machines, jig
- ☐ Boring Tools
- ☐ Brakes, hand, power
- ☐ Brazers, electric
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- ☐ Buffers
- ☐ Bulldozers
- ☐ Burnishing Machy.
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- ☐ Bushings, bronze
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- ☐ Bushings, jig
- ☐ Bushings, steel
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- ☐ Cabinets, tool
- ☐ Case Hardening Furnaces
- ☐ Castings
- ☐ Cement, disc grinding wheel
- ☐ Centering Machines
- ☐ Centers, lathe
- ☐ Chains, silent, roller
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- ☐ Chucks
- ☐ Chucks, air
- ☐ Chucks, auto.
- ☐ Chucks, collet
- ☐ Chucks, combination
- ☐ Chucks, drill & tap
- ☐ Chucks, geared scroll
- ☐ Chucks, lathe
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- ☐ Drill speeders
- ☐ Drill Twist
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- ☐ Drills, bench
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- ☐ Drills, multiple spdl.
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- ☐ Drills, radial
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- ☐ Extractors, tap
- ☐ Facers, spot
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- ☐ Filing Machines
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- ☐ Flexible Shaft Equip.
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- ☐ Forges
- ☐ Forging (Upsetting) Machinery
- ☐ Forgings, drop
- ☐ Forgings, upset
- ☐ Forming Machines
- ☐ Foundry Equipment
- ☐ Furnaces, hardness
- ☐ Furnaces, heat treating, Electric
- ☐ Furnaces, heat treating, oil or gas
- ☐ Gages
- ☐ Gage Blocks
- ☐ Gages, comparator
- ☐ Gages, dial
- ☐ Gages, plug, ring, snap
- ☐ Gages, taper
- ☐ Gages, thread
- ☐ Gears
- ☐ Gear Blanks, non-met.
- ☐ Gear Cutting Machy.
- ☐ Gear Testing Machy.
- ☐ Gears, cut
- ☐ Gears, rawhide and non-metallic
- ☐ Gear Pumps
- ☐ Generators
- ☐ Goggles
- ☐ Grease
- ☐ Grinders, pneumatic
- ☐ Grinders, air
- ☐ Grinders, bench
- ☐ Grinders, disc
- ☐ Grinders, external
- ☐ Grinders, flex. shaft
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- ☐ Grinders, internal
- ☐ Grinders, ped., elec.
- ☐ Grinders, swg. frame
- ☐ Grinders, pol., belt
- ☐ Grinding Attach.
- ☐ Grinding, centerless (contract)
- ☐ Grinding Mch., belt
- ☐ Grinding Mch., inter.
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- ☐ Grinding Mch., surf.
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- ☐ Indicators
- ☐ Jig Borers
- ☐ Jigs & Fixtures

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- ☐Milling Mch., plain
- ☐Milling Mch., vert.
- ☐Milling Mch., uprgt.
- ☐Mold & Die Cop. M.
- ☐Molded plastic prod.
- ☐Molybdenum
- ☐Motors
- ☐Motor-generator sets
- ☐Motor drives, univ.
- ☐Motor starters

- ☐Name plates
- ☐Nibbling Machines
- ☐Nut setting equip.
- ☐Nut tappers

- ☐Oil cups
- ☐Oil and grease seals
- ☐Oil groovers
- ☐Oils, cutting
- ☐Oils, lubricating
- ☐Oils, quench. & tem.

- ☐Patterns
- ☐Pillow Blocks
- ☐Pins, leader & dowl.
- ☐Pipe, cutting and threading mch.
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- ☐Press Brakes
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- ☐Presses, percussion
- ☐Presses, straighten.
- ☐Profiling Machines
- ☐Pumps
- ☐Pumps, coolant, lubricant & oil
- ☐Punching Machy.
- ☐Punches & Dies
- ☐Pyrometers

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- ☐Rotary Files
- ☐Router Bits

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- ☐Sanders
- ☐Saws
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- ☐Sawing Machines, circular & frict.
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- ☐Screw Cutting Tools
- ☐Screws, cap, set, saf. set & machine
- ☐Screw Drivers
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- ☐Screw Mch., hand
- ☐Screws
- ☐Scribers
- ☐Separators, oil
- ☐Shapers
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- ☐Steel Stamps
- ☐Stocks, die
- ☐Storage Racks
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- ☐Stripping Units
- ☐Swaging Machines
- ☐Tap Holders
- ☐Tapping Mchy. & At.
- ☐Taps, collapsing
- ☐Thread Grind. Mch.
- ☐Thread Rolling Mch.
- ☐Tool bits, hi. sp. st.
- ☐Tool Holders
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- ☐Tools, cutting
- ☐Tools, filing
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- ☐Tools, machinists'
- ☐Tools, sawing
- ☐Tracing cloth and paper
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- ☐Tube Flang. Mchy.
- ☐Tumbling Barrels
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- ☐Welding & Cutting Gases
- ☐Welders, arc
- ☐Welders, portable
- ☐Welders, elec. spot
- ☐Welding Gen., arc
- ☐Welding Mch., resist.
- ☐Wire-Working Mchy.
- ☐Wood-work. Mchy.
- ☐Wrenches

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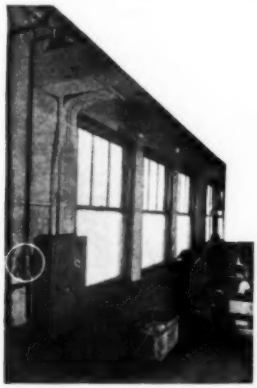
effects removal by means of centrifugal force. A series of ball bearing aluminum rotors, driven at high speed



by the compressed air, with no appreciable back pressure, causes impingement of moisture and contamination which is flung to the housing wall, out of the air stream, and down to an outlet below the rotors. Objectionable matter, thus removed, is collected in a trap for periodical disposal.

The unit shown, is providing clean, dry air to ejection equipment on punch presses in a radio parts plant.

Aridifiers are recommended for compressed air lines supplying sand blast equipment, spray booths, air tools and controls, foundry machines, tire inflators and other equipment, being available for lines from ⅜" to 10".

Bender Bulletin Shows Uses

A new bulletin issued by O'Neil-Irwin Mfg. Co., 316 - 8th Ave., So., Minneapolis, Minn., shows many unusual parts which can be made. The new Micro Multi-Purpose Bender is a compact tool for bench use and its versatility is demonstrated in the making of round, odd or irregular shapes of different sizes. It forms any radius from 0 to 6" diameter.

Mail

—48—

An Eastern reader inquires concerning the Diehl filing machine. He would appreciate descriptive literature and information concerning its operation and capabilities.

—49—

A farm implement manufacturer needs a gear hobbing machine which can be used for cutting teeth on worm gears, and also for cutting splines on shafts.

—50—

A manufacturer of watch cases is looking for a small automatic screw machine to turn pins with one and/or two shoulders from stock of about $\frac{1}{16}$" to 3/32" in diameter. Machine would probably be of the bench type and smaller than most of the automatics offered on the market.

—51—

A Southern machine works would like to purchase a galvanizing outfit for handling tanks 30" in diameter and 10 feet long.

—52—

A Midwestern manufacturer is anxious to obtain a fixture for holding tools on a planer which will swing on a 16" radius.

—53—

An Eastern reader wants to get in touch with a manufacturer of Loping Shears—adjustable leverage, point cut. Also, with the manufacturer of the Weaver Spot Welder.

—54—

A manufacturer of stampings inquires about a practical die maker's hand book, covering standard practices, tolerances and methods of making drawing, blanking and forming dies for sheet metal.

—55—

An Eastern manufacturer wants to purchase an automatic nut machine, using hexagonal stock from $\frac{3}{8}$" to $\frac{7}{8}$"—

Bag

threads .205-28 to 7/16" S.A.E. Must finish nut including tapping. Present production rate is 24 seconds which is too slow.

—56—

A reader in the East needs some pinion, gear and rack equipment. It includes a 7-tooth gear driving a 70-tooth gear and the latter can be between ½" and 1" in diameter. A pinion, integral with the large gear engages a rack with 40-teeth to the inch. The gears must be sensitive to the slightest movement of the rack—even .0001".

—57—

A manufacturer wants to get in touch with the manufacturers of the J. Morton Poole Roller Leveler.

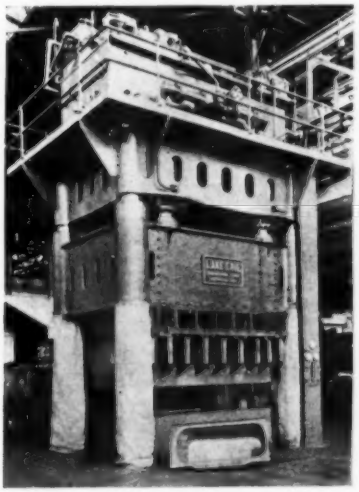
Giant Double Slide Press

A double slide hydraulic press having a capacity of 1700 tons and claimed to be the largest of this type, is announced by Lake Erie Engineering Corp., Buffalo, N. Y.

One of the many operations performed on this press is shown in the foreground—a steel bathtub.

Five-foot tubs are formed cold, 65" x 79", in one operation from 14 gauge sheets.

The press exerts a pressure of 900 tons on the blankholder and 800 tons on the main ram.



The high holddown pressure eliminates wrinkling of the edges of the sheet when forming the tub without the use of draw heads.

Press has a speed of several cycles per minute. Actual installations is shown, with top of bed located at floor level. Vertical columns are covered by flexible fabric boots, giving protection against abrasive dust resulting from dressing dies.

Entire press is self-contained with

pumping unit mounted on top. Operation is controlled by centrally located pushbuttons. Adjustable pressure control of blank-holder and main ram is provided.

With large daylight opening of 98" and long stroke of 37", together with large 160" x 106" bed equipped with cushion, this installation is a dramatic example of the successful application of hydraulic presses to difficult forming and drawing operations.

Gage Blocks and Accessories

Catalog No. 15 presents 36 interesting pages on the Johansson gage blocks, made by Ford Motor Co., Johansson Division, Dearborn, Mich. The introduction tells of the development of the gages and many photos show some of the ways in which they are used.

Buffalo No. 22 Drill

A 12-page bulletin No. 2989-D gives a very favorable impression of the new No. 22 drill, made by Buffalo Forge Co., 161 Mortimer St., Buffalo, N. Y.

Johnson "550" Has New Housing Unit

The Johnson Gas Appliance Co., 524 E. Ave. N. W., Cedar Rapids, Iowa, announces a new housing unit for the No. 550 pot-hardening and melting furnace for non-ferrous metals. Standard models are now built to the floor, instead of having legs, making them more substantial, easier to keep clean, and simpler to keep surroundings clean.

The No. 550 furnace is designed especially for salt, cyanide and lead hardening, and saves heating a large furnace for a few small parts, being especially convenient for small shops.

The No. 550 is also used widely by tool and die makers, and small plants for case hardening, and by pattern and model makers for melting small quantities of aluminum, brass and nickel-silver. It is furnished with crucible or cast iron pot, or with pot at extra cost. The temperature is easily regulated, and gas consumption is said to be low. It can be made to the users specifications.

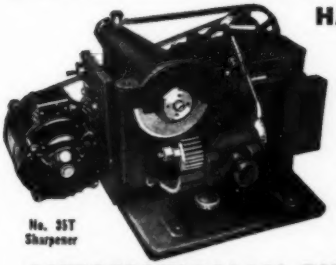
Tungsten Electrical Contacts

Metroloy Co., Inc., 57 East Alpine St., Newark, N. J., are now manufacturing electrical contact points made from highly fused pure tungsten metal. It is claimed this assures uniformity in grain structure, and eliminates excessive oxidization or pitting during operation periods.

The purity of this metal is said to prevent film coatings from adhering to contact surfaces during the time when apparatus is not operating or at shut-down intervals.

SHARPEN YOUR OWN SAWS

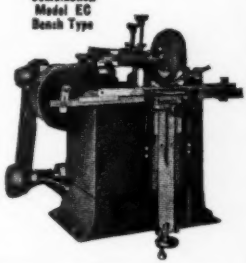
SAVE OVER 80% ON SHARPENING HACK, BAND, CIRCULAR SAWS



No. 35T Sharpener

The WARDWELL MODEL EC COMBINATION SAW SHARPENER will automatically sharpen saws with teeth as fine as 32 to the inch at a speed up to 75 per minute. Savings on 2 gross of blades will pay for the machine. Assures keener cutting saws at extremely low cost.

Combination Model EC Bench Type



AUTOMATICALLY SHARPENS METAL SAWS IN GANGS

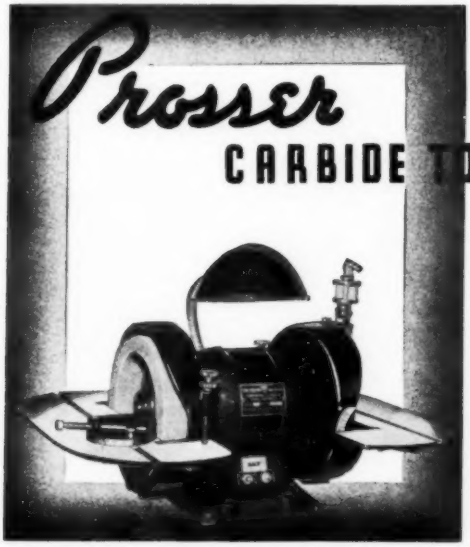
Up to 5½" diameter and up to 1¾" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

Write for complete information

THE WARDWELL MFG. CO.

3165 FULTON RD. CLEVELAND, OHIO



Prosser CARBIDE TOOL GRINDER

- Removes metal fast when rough grinding.
- Finish grinds smooth, keen cutting edges.
- This grinder will quickly pay for itself by increased tool performance and life between grinds.

$97.50

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Thomas Prosser & Son

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Gellert Tongs for Heavy Duty Handling

In plants where materials have to be handled by cranes or hoists, which include practically every industry, the use of Gellert tongs, now produced exclusively by Heppenstall Co., Pittsburgh, is said to decrease hazards to life and limb, and to cut lost time to a minimum.

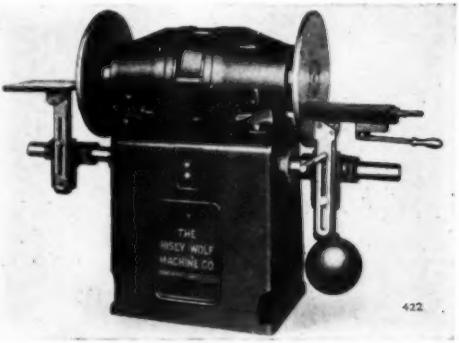
All that is required is to lower the tongs on to the work, and they do their job automatically. The craneman has entire control, and ground men do not have to throw chains around hot ingots or forgings, or climb to the top of scrap piles with danger of slipping or being crushed by material rolling down.

Several types are in successful operation in steel mills and foundries for handling ingots, ingot molds, die blocks, pipe, and wire; and other special designs are made for non-ferrous metal ingots or shapes, paper bales, sacks of sugar and similar materials. Lifting capacities run as high as 200,000 pounds.

To assure freedom from failure and long operating life, the working parts of these tongs are made of a nickel-chromium - molybdenum steel, corresponding to S. A. E. 4340, heat treated to provide ample strength along with toughness to resist shock loads.

Hisey-Wolf Refines Line

A noteworthy change of design has been effected in the direct drive disc grinders made by The Hisey-Wolf Machine Co., Cincinnati, O. Extra heavy end bells with feet are employed, which carry the bearings directly behind the discs. The bearing construction has been improved, as has the method of lubrication. Oilers are of the constant level type with sight supply.



The motor is totally enclosed with a circulation of air passing through motor, through feet of end bells into pedestal and back through motor again. This is claimed to afford the advantages of a totally enclosed motor with the added feature of cooler operation.

The machines are made in sizes from 3 to 10 h. p.

Guards can be supplied with exhaust connections. Combination machines can also be furnished with disc on one end and a regular grinding wheel or buffing extension on other side.

Haynes Stellite Expands

Haynes Stellite Co., Unit of Union Carbide and Carbon Corp., is expanding manufacturing facilities at its plant in Kokomo, Ind., by the addition of a new 75 x 132-ft. factory building, a one-story structure of steel and brick with concrete floor and wide monitor top. It is expected that the building will be ready for use in August. Some of the features of the building are:—continuous steel sash for efficient lighting; large ventilating fans for rapid air change; gypsum roof; modern toilet, locker, and shower facilities.

The new building will house machinery to be used in the manufacture of Haynes Stellite alloy products: metal-cutting tools, hard-facing rods, and special castings for resisting abrasion, corrosion, and heat. This new space will provide room for additional machinery and equipment for the fabrication and finish grinding of Haynes Stellite alloy parts, and at the same time improve the facilities for fabricating and finishing the Hastelloy alloy parts made by the company for resisting severe corrosive conditions.

Totally-Enclosed Motors

A new 4-page illustrated leaflet describing type CS totally-enclosed-fan-cooled squirrel cage motors from one to two-hundred horsepower is announced by Westinghouse. These motors are designed especially for operation in locations where corrosive fumes, abrasive dust, or splashing liquids are prevalent, and for use out-of-doors.

Photographs and cut-away sectional sketches explain the new heat exchanger principle which lets in no outside air yet keeps the internal windings from overheating. Many other features are described and illustrated. Thermoguard protection, which is optional equipment, is covered, and a paragraph on Underwriters approval is included.

Copies of descriptive data 3105 may be obtained upon request from Dept. 8-N-48, Westinghouse Elect. & Mfg. Co., East Pittsburgh, Pa.

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Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

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Lathe, Bench, South Bend 9" q. c.
Lathes, drill presses, all sizes.
Lathe, McCabe, two spindle, 44"—66"x14'.
Miller, Kempsmith No. 1 universal.
Miller, Cleveland universal, No. 1, s. p. d.
Miller, Rockford No. 2 universal, s. p. d.
Miller, Cincinnati No. 2 universal, s. p. d.
Miller, Van Norman No. 2 universal heads.
Presses, hydraulic, pumps, accumulators.
Saw, shaping, Peerless universal shaping, 12"x13" m.d.
Turret lathes, 26" Libby, 7½" hollow.
Send us your inquiries.

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Boring mill, 34" Colburn vertical.
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Grinder, No. 4 Badger disc, motor driven.
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Lathes, Porter-Cable Mfg. (2).
Miller, model C-1 Becker heavy vertical.
Miller, Brown & Sharpe, 76"x22½" table.
Planer, 36"x36"x10' American, m. d.
Shaper, 25" Smith & Mills, m. d.
Shear, No. 13 Pettingell 14 ga.
Welder, 150 Toledo spot, 20 kw hand operated.

Chas. E. Lowe Co.
174 Pearl Street Hartford, Conn.

Automatics, 1¼" cone, Madison-Kipp oiling system, 900 serial.
New Britain-Gridleys, 1¼", four spindle, late type.
Model G Gridley, ¾", m. d., anti-friction spdls. 17000 ser.
Model G Gridleys, 1¼", m. d., anti-frict. spdls. 8000 ser.
Model J, Gridleys, 2½, 4½" single spindle.
Model F Gridleys, 2½" No. 53; No 55 Acme, m. d.
Model H Gridley, 4" Chucker, anti-fric. spdls. 15000 ser.
Cylinder grinders, 12x36; 12x60 Modern.
Model "A" Clevelands, 2½", 2¾", 4¼".
No. 00 Brown & Sharpe, 5 hole turret, 509 serial.
Thread millers, 3" Waltham, b. d.

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24"x12' Schumacker-Boye, l. c. g.
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Shear, Niagara power, 8', 14 ga.
Spotwelders, 20, 30, 100 K. V. A.

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Lathes, engine, 53"x34' Nicholson-Waterman, geared faceplate, taper; 27"x24' Lodge & Davis, l. c. g.; 24"x16' Whitcomb-Blaisdell q. c., taper; 15"—24"x8' Sebastian gap, q. c., g. h., a. c. m. d.; others.
Planers, 38"x36"x10' Pond, 4 heads; 24"x24"x7' Gray.
Shapers, 25" Smith & Mills, 20" Smith & Mills (clutch in driveshaft), 20" Whipp, all b. g. cone dr., others.

Nelson Machinery Co., Green Bay, Wis.

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Grinder, Cochrane Bly No. 11S auto. saw, cap. 10" to 32".
Grinder, Niles-B-P. 12x36 Universal Mfg., belted.
Hobber, Barber Colman No. 12.
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Miller, No. 3 Cincinnati plain, s. p. d.
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Press, No. 21½ Bliss, blanking, m. d.
Press, horning, No. 40 Bliss.
Press, Consolidated, s. s., 5" shaft, 44" wide.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Press, No. 94-A Toledo dbl. crank, 6" shaft, 6" stroke, 40" wide.
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Drill, No. 2 Fox, 6 spindles.
Drill, Moline hole hog, 3-sp. No. 4 Morse taper.
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Drill, radial, 5' Cincinnati Bickford.
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No. S 206 Ferracute, dbl. crank 124", crank 7½"—9".
No. SG 107 Ferracute, dbl. crank, 96", crank 5½".
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No. 910B Stoll, toggle press, 7" 8" crank, 8½" draw.
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250 ton No. 56 Bliss, 250 ton Waterbury F. coining.
100 ton No. 21 Bliss, 50 ton No. 3 Bliss coining.
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Boring mill, 62" Bullard, 2 heads, grd. feeds, m. d.
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Gear hobber, No. 12 Barber Colman, s. p. d.
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Lathe, 14"x8' Rockford, q. c. g., d. b. g., b. d.
Lathe, 14"x8' Pratt & Whitney, p. c. g., t. a., b. d.
Lathe, 16"x8' Hendey, q. c. g., t. a., b. d.
Lathe, 18"x10' Hendey geared head, t. a., m. d.
Lathe, 20"x24' Lodge & Shipley, q. c. g., b. d.
Lathe, 21"x10' LeBlond auto. mfg., belt drive.
Lathe, 24"x10' Bradford, q. c. g., t. a., b. d.
Lathe, 24"x14' Schumacher & Boye, q. c. g., b. d.
Lathe, 24"x14' Lodge & Shipley, q. c. g., d. b. g., b. d.
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Lathe, 36"x30' Pgh., grd. hd., q. c. g., m. d.
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Lathe, 36"x22" Schumacher & Boye, q. c. g., b. d.
Lathe, 36"x32' L. & S. grd. hd., q. c. g., t. a., m. d.
Lathe, 51"x32' New Haven, triple geared, motor drive.
Lathe, turret, No. 2 Warner & Swasey, b. d., (2).
Lathe, turret, 16" Warner & Swasey, b. d.
Lathe, turret, 21" Gisholt, h. s., 3½", t. a., b. d.
Lathe, turret, No. 4 Warner & Swasey, b. d.
Lathe, turret, 24"x26" Pratt & Whit., grd. hd., s. p. d.
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Miller, plain, No. 3 Cincinnati, b. d.
Miller, plain, No. 3 GH Hendey-Norton, s. p. d.
Miller, plain, No. 24 Brown & S. tbl. 80"x17½" b. d.
Miller, univ., No. 3 Brown & Sharpe, d. h., b. d.
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Miller, vertical, No. 1½ Knight, m. d.
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Pipe machines, No. 304-B, Oster, m. d.
Pipe machines, 6" Landis gear box a. c., m. d.
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Pipe machine, No. 1½ Merrill, 2½" to 12", motor drive.
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Press, baling, 13-P Logemann hydraulic, m. d.
Press, coining, ELG, 4 Ferracute.
Press, dbl. crank, Stoll 79-D, 72"x26", m. d.
Press, No. 95 Bliss, dbl. crk., str. 3½", m. d.
Press, No. 83 Cleveland, stroke, 2½" roller feed, m. d.
Press, toggle, Garrison 500 ton, bed, 48"x60".
Press, trimming, No. 2 Billings & Spencer, 80 tons.
Presses, wheel, 100-ton Hydraulic.
Profilers, Nos. E3 and E4, Keller, motor drive.
Punch & S., Cleveland, 36" thrt., 1½"—1", m. d.
Punch, lever, No. 58 Niagara, 36" throat.
Riveting hammer, No. 5½B high speed, m. d.
Roll, bending, 7'x¾", Pyramid Type, b. d.
Saw, band Type JM Laidlaw, cap. 6", m. d.
Saw, shaping Peerless 6"x6", m. d.
Saws, hack 9"x9" Peerless & 8"x8" Atkins.
Screw machine, No. 52 National Acme, s. p. d.
Screw machine, No. 2 Warner & Swasey, b. d.
Shapers, 16", 20", 24" & 28", belt or motor drive.
Shaper, 20" Stockbridge, p. d. f., b. g., m. d.
Shaper, 24" Columbia, d. b. g., gear box, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, Alligator, No. 7 United Eng. & Fdy. Co.
Shear, billet, R. S. Newbold, 4"x4", m. d.
Shear, billet, No. FV-23 Pels, 3" round cap., m. d.
Shear, Bloom, United 6"x6" hot, m. d.
Shear, rotary, No. 10 Quickwork, 14 ga. 60" throat.
Slotter, 8" Betts, table 20" dia. b. d.
Straightener, plate, Bertsch 84"x1½", 7-roll, m. d.
Straightener, No. 1 Kane & Roach cap., ⅜" rd. m. d.
Straight'er, strip & cut., No. 1 Schuster, 2½"x¾", m.d.
Welders, 200 amp. Gen. Elec.—300 amp. Lincoln.

USED AND REBUILT MACHINERY

FOR SALE BY

D. E. Dony Machinery Co.
47 Laurelton Rd., - Rochester, N. Y.

Carburizer, American No. 1-F Rotary.
Drill, Avey 4-spindle No. 2.
Drill grinder, Oliver 1½", m. d.
Filters, Fostoria, for cent. grinder.
Shaper, Steptoe 14", m. d.

Rosenkranz, Weisbecker & Company, Inc.
2308 Singer Building, New York, N. Y.

Boring mills, 60" Betts vertical, motor drive.
Gear cutter, 110" Newton, motor drive.
Grinder, Cincinnati 24", face mill, motor drive.
Keyseater, No. 20 Catlin, m. d.
Miller, 24"x24"x12' Ingersoll, adj. rail, m. d.
Millers, 2 Ingersoll hor. facing mills, 9" spdls., m. d.
Miller, P. & H. vertical openside, keyseat, m. d.
Planer, 10'x7'x18' Betts, 4 heads, PRT.
Slotter, 18" Niles, vertical, m. d.
Slotter, 24" Dill, motor drive.

General Machinery Corporation
140 Federal St., Boston, Mass.

Drill, radial, Dreses-Mueller, 3' old style.
Drill, Fairbanks 20", b.g., belted power feed.
Grinder, Ohio (Oesterlein) No. 3 universal cutter.
Lathe, Lodge & Shipley, 18"x10' screw cutting.
Lathe, Sloan & Chase No. 5, precision bench.
Lathe, Worcester 12"x5' screw cutting.
Miller, Milwaukee No. 1, universal.
Planer, Gray, 37"x7', c/s.
Press, Bliss-Consolidated No. 1, rolling key clutch.

Chas. Molitor Machinery Company
118-124 S. Clinton St. - Chicago, Ill.

Drilling and milling machines, No. 1½, No. 2 Knight.
Grinder, No. 17 Beaty disc.
Grinder P & W, auto. for thread milling cutters.
Lathes, Rivett, 4" Hardinge, bench.
Lathe, 21"x8' LeBlond, q. c., heavy duty.
Millers, Pratt & Whitney, Gooley Prod.
Radial, 4' Cincinnati Bickford, cone drive.
Screw machine, No. 2 B. & S. wire feed.
Screw machines, No. 1, 3, 4, B. & O., W. S., Acme.
Shapers, 7" Rhodes, 14" Steptoe, 16" Kelley, 24" P. & J., 24" Rockford.

Russell Machine Co.
438 Oliver Bldg. Pittsburgh, Pa.

Boring mill, 42" Gisholt, 2 heads., m. d.
Boring mill, 10' Niles vertical.
Cranes, 5 ton Shaw, EOT, 50' span, 3 motor. (2)
Drill, radial, 6' American triple purpose.
Gear cutter, 36" Brown & Sharpe.
Hammer, 2500 lb. Chambersburg dbl. frame steam.
48" Morton Keyway cutter, cap. 3½" wide.
Lathe, 36"x30' Pittsburgh geared head, m. d.
Lathe, 52"x23' Pond triple geared.
Lathe, turret, 24"x26" Pratt & Whitney, g. h., b. d.
Pipe cutting and threading machine 6" Merrill.
Planer, openside, 48"x68"x12', D. & H., 3 hds., m. d.
Press, hyd. wheel, 100 ton Caldwell.
Press, No. 83 Cleveland, str. 2½", roller feed, m. d.
Shaper, 24" Gould & Eberhardt
Shaper, 24" Columbia, d. b. g., gear box, m. d.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

FOR SALE BY

Bradley Machinery Co.
529 E. Jefferson Ave., Detroit, Mich.

A FEW ITEMS (PRICED) FROM OUR STOCK

Air compressor, Bury, 10x10.	
Automatic, New Britain, 6 spindle, 1"x5"	$1250
1—1¼x7 New Britain.	
Bar shear, Doty (new)	350
Drill radial, 5' Cincinnati Bickford	1350
Drills, 6 spindle, 2 spindle and single spindle	600
Gear hobber, G. & E., 16".	
Grinder, chucking, No. 6 Bryant	450
Grinder, surface, No. 33 abrasive, motor in base	750
Grinder, 12x72 Brown & Sharpe, plain	650
Grinder, 10x52 Norton	750
Mills, Cincinnati, 18" automatic.	
Mills, Cincinnati, 24" automatic.	
Press, P-3 Ferracute	250
Press, PC-2 Ferracute	150
Press, 150 ton coining, Ferracute	850
Turret lathe, No. 4½ B. & O.	200
No. 4 Warner & Swasey.	
No. 6 Warner & Swasey.	

Hundreds of other items priced low.

R. S. Armstrong & Bro. Co.
676 Marietta St., N. W., - Atlanta, Ga.

Compressor, 7x6 Sullivan, horiz., b. d.
Compressor, 12x10, I-R, horizontal, b. d.
Drill press, 36" Superior, sliding head, b. d.
Hack saw, No. 7 Atkins, b. d., 2-speed.
Keyseater, No. 2 Mitts & Merrill, b. d.
Lathe, 18"x24' Bradford, l. c. g., taper att., b. d.
Lathe, 20"x8' American, q. c. g., cone drive.
Lathe, 3½"x36" Acme universal turret, air chuck, m. d.
Miller, No. 1½ Queen City plain, b. d.
Miller, No. 4 Kempsmith plain, b. d. and feed.
Motors, electric, large quality.
Press, No. 18 Bliss o. b. i., b. d.
Shapers, 16" Barker and American, 24" Cincin., b. d.
Shear, Thompson bevel patch
Shear, No. 2 Bethlehem circle, b. d.
Welding generators, acetylene, 10-30-50 pound.

Send us your inquiries.

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Boring machine, No. 1 Barrett, cylinder.
Drill, No. 3 Barnes horizontal, double head.
Drill, 2½' Fosdick radial, round column.
Gear hobber, No. 1 Adams Farwell.
Grinder, Gisholt universal.
Lathe, 22"x14' Davenport, g. c. g.
Saw, cold, Lea-Simplex, 5½".
Screw driver, No. 2 Reynolds, auto. feed.
Screw machine, 3" Cleveland automatic "A".
Turret lathe, 19" P. & W., geared head.

H. F. Wolnick Machinery Co.
9 S. Clinton Street, - Chicago, Ill.

Boring mill, 8' Niles vertical, 2 threads, back drive.
Generator, 6"x11" Gleason, bevel geared.
Lathe, 15x6 Pratt & Whitney.
No. 4 Warner & Swasey, motor drive with motor.
Mill, No. 1½ Becker plain.
14" Pratt & Whitney vertical surface grinder with chk.
Mill, No. 32 Kempsmith production.
Planer, Ohio, 24x24x6.
Punch and shear, 1"x10' Cincinnati, motor drive.
Shaper, 24" Smith & Mills.

FOR SALE BY

B. D. Brooks Co., Inc.

119 Broad St. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders,
Bending rolls, corrugating rolls, forming rolls,
Punches, beaders, rotary machines, stakes, etc.

FOR SALE BY

Bleser Machinery Company

209 N. Sixteenth St., - Springfield, Ill.

Air compressor, auto. unit, 5 h. p. $150
Drill presses, 20" to 34".
Lathe, 15"x8' LeBlond, q. c., t. a. 360
Hammer, power trip, 25 lb. Little Giant 75
Press, punch, 1½" stroke 85

The State Machinery Co., Inc.

865 Congress Ave., New Haven, Conn.

A Few, Like New Items, from our Stock.
Arbor presses, No. 17 Greenerd, (10), ea. $225
Arbor, presses, 8 Greenerd, (3), ea. 475
Millers, P. & W. automatic, (6), ea. 850
Wheel polisher, centerless, Production, No. 101 575

C. R. Daniels

1514 W. Capitol Drive, Milwaukee, Wis.

Hack saw, No. 1 Marval 4x4, rebuilt, $22.00.
Keyseater, No. 2 Mitts & Merrill, complete.
Pressure blower, Wilbraham positive, 2340 ft.
Press, No. 2 Toledo O. B. I., flywheel type.
Press, 400 ton Bliss, No. 358 double toggie.

Marr-Galbreath Machinery Company

57 Water St., Pittsburgh, Pa.

Air compressor, 9x8" & 14x12" Ing-Rand.
Ball or jar mill, 2-jars 10x12", belt or m. d.
Blowers, (furnace) No. 2 Knight; No. 3 American.
Blower, pressure, No. 11-PB Am. 14378 cfm., m. d.
Bolt cutter, 1½" Landis, sgl. head.
Boring mill, 30" Bullard vert., threading attach., b. d.
Boring mill, 84" Pond, 2-hds,. Fctn. feed, c/s.
Brakes, hand, 4' Keene, 18 ga.
Brake, 8'x12 ga. Chicago, power, belted.
Brake, crimp and corrugating, 10'x16 ga. Keene.
Driller, horiz., 6 spindle Nat'l. Acme, No. 2 chucks.
Drill, radial, 2' Am., gear box, s. p. d.
Drill, radial, 3' and 4' Dreses.
Drill, 22" Champion, b. g., p. f., m. d.
Drills, gang, 3 and 4 spindle, 1 to 4 MT.
Exhauster, No. 35 Buffalo, outlet 12x14", m. d.
Fan, ventilating, 24" American, m. d., 1/60.
Forging machine, 1½" Acme, all steel, side shear.
Furnace, T-J, 25x23x12" ID. 17000 f.
Gear pinion, No. 3 Sloan & Chase, auto. bench.
Grinder, No. 2 Grand Rapids Tool.
Grinder, No. 12 Besley, double end disc.
Grinder, No. 21 Landis, plain, 10x30", c. s.
Grinder, portable surface, No. 6-OA, motor, 3/60.
Grinder, surface, 36x24" Diamond, hydr. feed, m. d.
Grinder, univ. C. & R. No. 3 B. & S.
Grinding spindle, Excello No. 39, bracket 5002.
Hack saws, No. 3 & 4 Economy, belted.
Hack saws, No. 7 & 14 Atkins, belted.
Hammers, 80 lb. Boss, No. 2, with dies, belted.
Hammer, 200 lb. Bradley upright helve, motor drive.
Hammer, 3000 lb. dble. frame, steam.
Hammer, 400 lb. Bliss board drop (rebuilt).
Hammer, 1000 lb. Chbg. steam drop, double frame.
Hoists, ½ to 1½-ton hand chain.
Hoists, Canton No. 1 portable.
Hoists, 10-ton Euclid, 3/60/220 (2).
Keyseater, Morton, cap. 2½"x24", s. p. d.
Lathe, No. 4 Rivett, bench, draw-in-att.
Lathe, 11/16"x4' Artisan, q. c. g., s. p. d.
Lathe, 14"x6' Mulliner-Edlund, q. c. g., t. a.
Lathe, 15/22"x8' Sebastian gap bed cone.
Lathe, 17"x8' LeBlond, q. c. g., 3-step cone.
Lathe, 18"x6' National, q. c. g., d. b. g., chuck.
Lathe, 18"x10' Hendy, q. c. g., t. a.
Lathe, 20"x10' Boye & Emmes, q. c. g.
Lathe, 22"x12' Rahn-Larmon, pl. change gears, t. a.
Lathe, 26"x10' Wolcott, q. c. g., d. b. g., 2½" h. s.
Lathe, 27"x10' L. & S., 5-step cone, q. c. g.
Lathe, roll, 44" Hyde Park, m. d.
Lathe, 36"x20' Springfield, m. d., 230 v. d. c.
Marking machine, No. 3 Noble & Westbrook.
Miller, No. 2 Cin. univ., (old model), Cullman, m. d.
Milling machine, univ. No. 4 B. & S. cone, (old).
Miller, mfg. type, Kempsmith, table 44"x12".
Motors, 15 h. p., West. 3/60/220—440/870 rev.
Motors, 25 h. p., Allis-Chalmers 3/60/220/680 rev.
Motors, 30 & 40 h.p., West., CS. 3/60/220/570 rev.
Nailing machine, No. 6 Morgan, 8-track, m. d.
Nibbling machine, No. 1 Campbell, 6" thr. 3/16".
Pinion cutter, No. 3 Sloan & Chase, capacity 1x1".
Pipe machine, ½ to 3" Jarecki, belted.
Pipe machine, 4" Williams, cap. ½" to 4", m. d.
Pipe machine, 8" Williams "Rapiduction", m. d.
Pipe machine, 6" Landis "Lanco", m. d.
Pipe machine, 8" Jarecki, cone or m. d.
Pipe machine, 18" Wieland "Standard", m. d.
Planer, 26"x26"x8' Niles, 1 hd., belt m. d.
Press, arbor, 42" Weaver, hand.
Press, foot, Lewthwaite, wt. 400 lb., (4).
Press, horn, No. 16½ Bliss, plain, stroke 1½".
Press, o. b. i., bench, No. 100-B Perkins.
Press, OBI, No. 4 L. J., 2" stroke, plain.
Press, o. b. i. No. 1 Thomas, 2" stroke, m. d.
Press, punch type, equal 5½ Bliss, 10,000 lb.
Press, sgl. crank, 59½ Toledo, str. 8".
Punches, s. c., 36", 48", 60" cap., 1¼"x1", m. d.
Punch & shr., comb., No. 5 Buffalo, hand, cap. ½"x1".
Punch & shear, S. E., 6" th., No. 3 L. & A., rapid a.
Riveter, 3A, h. d., cap. 5/16", high speed, s.p.d.
Riveter, No. 5-A, high speed, cap. ¾", m. d.
Riveter, 103 Grant, m. d., 3/60/220 v., cap. 5/16".
Rolls, bending, 37x2½", DE, Bertsch & P S & W. 18 ga.
Rolls, 30"x6" United, 2-rolls (for leather).
Saws, metal, 4x4" Napier, m. d.
Saw, shaping, 6x6" Peerless, motor 3/60.
Shaper, 15" Blount, single geared.
Shaper, 16" G. & E. motor 3/60/220. (old).
Shaper, 20" American, cone or m. d.
Shaper, 20" G. & E., B. G. crank, cone.
Shaper, 20" Columbia b. g. crank, gear box, s. p. d.
Shaper, 21" Averbeck, b. g., cone.
Shear, bar, No. 3 United, 24" blade, cap. 2½" sq., m. d.
Shear, Billet, cap 60"x2", m. d.
Shear, Blocks & Blades 52"x½" cap. 1500 lb.
Shear, rotary, ¾" throat, 42" belt.
Shear, rotory No. 2 Standard, cap. 10 ga., b. d.
Shear, squar. 8'x18 ga., P. & W., foot power. (new).
Shear, B-36 Stanley Unishear, cap. ½", m. d.
Shear, O-36 Stanley Unishear, cap. 14 ga., m. d.
Straightening rolls, Cleveland 60"x½", m. d.
Tapping machine, ½" Pratt & Whitney, b. d.
Testing machine, 1000 lb. Olsen hyd., hand.
Tiering machines, 600 lb. Economy, hand power,
Tractographs, Airco No. 1, (4).
Transmission, Reeves No. 00-E. (new)
Turbines, 100 h. p. Westinghouse, 900 rev.
Turret lathe, 18"x6' Springfield, Fox Monitor.
Turret-screw machine, 1"x15" P. & W.
Upsetter, 1½" Acme, all steel.
Welder, arc, 160 amps, a. c., (near new) (2).
Welder, arc, 280 amp., a. c. Hampton (new).

USED AND REBUILT MACHINERY

FOR SALE BY

General Blower Company
401 N. Peoria St., - Chicago, Ill.

BLOWERS—FANS—EXHAUSTERS.
For Dust Collecting — Ventilating.
Oil and gas burners, cupolas, furnaces, etc.
Roots—Connersville and centrifugal blowers.
What are your blower requirements?

Failor-Strafer Machinery Co.
132 Liberty St., - - New York, N. Y.

Automatic, 5½" Model A Cleveland, motor drive.
Blue print machine, Paragon, type B, size 42, m. d.
Boring mill, 5" bar, D. & H., horiz. floor type.
Drills, 3' and 3½' Cincinnati-Bickford radials.
Drill radial, Amer. 3' sens., tapping attachment.
Gas furnace, No. 4 American, door opening 8"x14".
Grinder, Oliver 4 wheel wood tool grinder.
Lathe, 26 x10' Walcott, 3 step cone, d. b. g.
Lathe, 13"x6' Willard, 3 step cone, d. b. g.
Lathes, Le Blond, 19", 21", hvy duty, 3 st. cone, d. b. g.
Lathes, 18"x14' and 18"x10' Lodge & Shipleys.
Lathe, 18"x8' American, modern, 3 step cone, d. b. g.
Lathes, 24"x24" and 3"x36" J. & L., bar equipt.
Pipe machines, 6" Wieland, 4" Williams, m. d.
Shears, squaring 12'x3/16" Ohl.
Shear, squaring 10'x3/16" Loy & Nawrath, arr. m. d.

FOR SALE BY

C. C. Howarth Machinery Company
1440-1444 Franklin St., Detroit, Mich.

DESIRABLE MACHINES ON OUR FLOOR
Lathe, 14x6 Hendey.
Lathe, 20x10 Monarch, cone drive.
Miller, No. 3 Van Norman, m. d.
Miller, No. 20 Van Norman, m. d.
Shaper, 24" G. & E., m. d.
Shaper, 20" Rockford, b. d.
Shaper, 16" American, m. d.
Slotter, Garvin 4" stroke.—And many others.
Send us your inquiries.

L. L. Richards Machinery Co.
3804 N. Fratney St., Milwaukee, Wis.

Arbor press, No. 5 Greenerd, power driven	$ 175
Drill, 2-spindle Kern, t. a. rebuilt	250
Lathe, 18"x8' Le Blond, q. c. g., m. d	500
Planer, 30x30x10' Cleveland openside, one head	1650
Radial, 6' Bickford, gear box, s. p. d	1000
Saw, 6" Racine, cab. base, rebuilt	100
Shaper, 16" American, b. g.	350
Threading machine, Bridgeport automatic	750

West Penn Machinery Company
1210 House Building, Pittsburgh, Pa.

Air compressors, 30 to 2500 cubic feet.
Baling press, 32-P, Logeman, m. d.
Air compr. portable gas 1-R 180 cu. ft.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutter, 1" Landis, double head, b. d.
Bolt cutters, 2" & 3" Acme, b. d.
Bolt threaders, automatic, Landis 1", m. d.
Boring mill, 42" Bullard, 2 heads.
Bulldozers, Nos. 2, 4, 6, 9, 28, & 30.
Brake, 10'—14 ga., D. & K., hand.
Crusher, jaw, No. 4 Chiampion, b. d.
Draw bench, 30,000 lbs. W.-F., 22' draw., m. d.
Drill sharpener, Ing.-Rand "Leyner", 1¼".
Drill, radial, 2½, Fosdick, s. p. d.
Drill, radial 6' Reed-Prentice, single pulley drive.
Drills, 4 spindle Avey, No. 2 m. t., s. p. d.
Drills, upright 10" to 36".
Engine, gas, 20 horse power Bessemer.
Flanger, McCabe, 8" capacity, dies.
Gear cutters, Nos. 5 & 6 B. & S., 60" & 72" m. d.
Gear cutters, 11", 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinders, centerless Heim, m. d., 220/3/60.
Grinder, disc, No. 4 Gardner, 22" 220/3/60.
Grinder, drill, No. 31 Oliver, 1½", m. d., 220/3/60.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 30"x76".
Grinder, surface, No. 2 B. & S., m. d., 220/3/60.
Grinder, surface, No. 1 Diam. 14x24, mag. chuck, m. d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60.
Grinder, T. & C. No. 1 Le Blond, m. d.
Grinder, disc, No. 8—20" Besly, belt drive.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammer, power, 100 lb. Bradley cushion helve.
Hammers, Nos. 2-B, 3-B, 4 B, 6-B, Nasel.
Hammers, steam, forging & drop.
Lathe, 26"x12' Putnam, q. c. g., d. b. g.
Lathe, 42"x16' Schumacher Boye, q. c. g., belt drive.
Lathe, 48"x30' New Haven, 22' centers, b. d.
Lathe, turret, No. 2 Warner & Swasey, belt drive.
Lathe, turret, No. 1 Garvin, belt drive.
Lathe, wheel, 78"x84" Bement, motor drive.
Lathe, spinning 32" belt drive.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, vertical No. 2 Knight, b. d.
Mixers, Sprout-Waldron, batch & liquid.
Pipe mche., 2", 4", 6", 8" & 12" Landis-Oster-Williams.
Planer, openside, 48"x48"x14' D. & H., m. d.
Press, forging, 150 ton United, steam hyd.
Press, hydraulic 100-ton Southwark.
Presses, OBI, No. 19 Bliss & No. 4 Niagara, 2" str.
Press, No. 55 Toledo, bed 20x19.
Press, screw, No. 87 Niagara, hand power.
Press, 6 spindle, Waterbury-Farrell.
Press, arch, No. 30 Bliss, roll feed, b.d.
Pumps, centrifugal 6", 4", 1", motor drive.
Punch, comb., No. 12 Badger, ¾"—4; 1¼" round.
Punch, EF Cleveland, 36" throat, 1¼" thru 1".
Punch, multiple, 32 E. W & W, 10' 2".
Punch, horiz. No. 7 Kling, m. d., 220/3/60.
Riveters, air, hammer, spinning.
Rolling mill, cold 9"x18" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, cold, 48" Newton motor drive.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x1 Long & Allstatter, m. d.
Shear, Niagara 42"x14 ga., belt drive.
Shear, Niagara 42"x10 ga., belt drive.
Shear, No. 162 Niagara, 62"x18 ga., b. d.
Shear, Stoll 60"x3/16", motor drive.
Shear, 8'x14 ga. Ohl, m. d., 110/220/1/60.
Shear, 10', 16 ga. Niagara, b. d.
Shear, circle, Niagara, 4" cutters, 16 ga
Shear, circle No. 3 Bliss, 40"x20 gauge.
Shear, Guill., No. 5 H. & J., 4½" rd., m. d.
Shear, guill. No. 2 H. & J., 2½" rd. b. d.
Shear, 10'x¼" Bliss, holddown, b. d.
Shear, plate, 96"x¼" Toledo, m. d.
Shear, plate, No. 6 H. & J., 84"x¾", m. d.
Slitter, gang, No. 2 W-F, 18", belt drive.
Slitter, gang, 36" Yoder motor drive.
Slitter, gang, 36" Braddock, belt drive.
Slotters, 6" & 24" Newton.
Straightener, 12'x¾" Shuster, b. d.
Straightener, 12'x¾" Shuster, b. d.
Straightener, AS & TP 12"x3/16", belt drive.
Straightener, 48" Aetna-Standard, 17 roll 3", m. d.
Testing machine, 400,000 lb. Riehle, b. d.
Thread rollers, W-F No. 20—2".
Tumbling barrel, 34"x48", belt drive.
Upsetters, 1" to 6".
Welders, spot, 12, 13 & 18 K. V. A.
Welders, arc, 300 amp. Lincoln.

CONSIDER GOOD USED EQUIPMENT FIRST!

IMMEDIATE AVAILABILITY AND DELIVERY ARE IMPORTANT FACTORS

BALER
Logemann Model 13P Horiz. Hy. Box 58"x22"x16". Size of Bale 16"x16"x10"

BENDING ROLLS
10' Bertsch Initial Type, Motor Driven Capacity 1¼" Plate
10' Kling, MD Capacity ¼"
20' Niles, M D., Capacity ¼"
24' Hilles & Jones, M.D. Cap.1"

BORING MILL—HORIZ.
8" bar Barrett Cyl. Bor. B.M.D.

BORING MILLS—VERTICAL
42" King, M.D. Equiped with 5 Station Turret Hd. & Plain Rail Head. Power Rapid Traverse in all directions.
52" King, M.D. Equipped with Two Plain Rail Heads. Power Rapid Traverse in all directions

BRAKE—LEAF TYPE
6' D.&K. "Chicago" No. 167 Motor Driven, Capacity ¼"

BRAKES—PRESS TYPE
6' Dreis Krump, M.D., Cap.¼" 8'6" Loy & Naw., M. Dr. Cap. No. 10 Ga.

BULLDOZERS
No. 7 Ajax, M.D. face of cross head 12"x76" Stroke 16"
No. 7 Williams & White, M.D. Face of Crosshead 16"x70". Stroke 22"

CRANES—OVERHEAD ELECTRIC TRAVELING
5 ton Bedford 35' 6" Span, 220/3/60 AC
10 ton North. 49' Sp. 220VDC
10 ton American 59'10" Span, 220/3/60 AC
10 ton Northern 66' 9" Span, 440/3/60 AC
10 ton Champion 85'11" Span, 440/3/60 AC
20 ton Morgan 50' Span, 220 Volt DC 5 ton Auxiliary
20 ton Morgan 62' Span, 230 Volt DC 10 ton Auxiliary

CRANE—GANTRY
4 ton Link Belt, 100' Span 220 /3/60 A.C. With 2 Yd. Williams Clam Bucket

FLANGING MACHINE
¼" McCabe Pneumatic Flanging Machine

FORGING MACHINES
3" to 7" Ajax, Nat. Acme,St.Fr.

FURNACES
9000 lb. Swindell Electric Melting Furnace Complete with 1800 KVA 22,000/3/60 Trans.
10 ton No. 5 Heroult Slag Melting Furnace Complete with 7500 KVA 11,000 / 3 / 60 Transformers (New)

HAMMERS—BOARD DROP—STEAM DROP-STEAM FORG.
1000 lb. to 8000 lb Chamb., B. & Sp. Erie, N-B-P Morgan

JOGGLING MACHINE
No. 2 Morgan Plate, M.D. Cap. to joggle ½" Plate 42" f. edge

6500 lb. ERIE BOARD DROP HAMMER

40'x6" HILLES & JONES PLATE EDGE PLANER Capacity 1-¼" Plate Motor Drive

6000 lb. CHAMBERSBURG STEAM FORGING HAMMER Double Frame—Guided Ram Type

LATHE
New Haven Lathe, M.D. 21' Between Centers 72" Swing, with 10" Raising Block

LATHES—AXLE
31"x13'6" Putnam Hvy. Duty, M.D. 102" Distance bet. Cent. No. 3 N-B-P Dbl. Axle Lathe, Hvy. Duty. M.D. 111" Distance Between Centers

LATHE—ROLL
44" Hyde Park Dble. Roll Lathe, M.D. 33' Bed, head stock at each end, 22' betw. centers.

PLANERS
48"x48"x16' Cinc. 2HD., MD.
60"x52"x22' Lib. 3 Hd., M.D.
72"x48"x16' Gray Four Head, M.D. (New)
72"x60"x31' Pond 2-Head,B.D.
100"x84"x25' P'd 4-Hd.,B.M.D.

PLANER—OPENSIDE
48"x48"x16' D.&H. 3 H.,BMD

PRESSES—HYDRAULIC
300 tn Chambersb. Self-Cont. 4 Col Hydro-Pneu. P. 12" Dia. of Ram, 18" Str., 49" Bet.C.
3000 ton Wood Four Col. Forg. Press, 36" Dia. of Ram, 24" Str., 22"x41" Betw. Columns

PRESS—STRAIGHT SIDE
No. 96F Toledo Double Crank, 12" Str. 124" Bet. Uprights

PUNCH—BEAM
Kling Beam Punch & Cop. Mch., Arr. for M.D. Cap. to cope or notch 6" to 24" I-beams, Eqp. to punch 6 ¾" holes in ¾" plate; shr. 8" chan. or I-beams

PUNCH—MULTIPLE
HILLES & J. No. 7, 98" Betw. Hous., 18" Thr., M.D., Cap. to punch 40 13/16" holes thru ¾" plate. Equipment Thomas Spac. Table 22'6" long

PUNCH & SHEAR COMBINATIONS
No. 6 Beatty Dble. End, M.D. 16" Thr. Cap.Punch1" thru
No. 14 Wil. & W. Sgle. End, M. D. Lysholm Table Cap. Punch 1¼"x1" Throat 48"
Hil. & J. Punch, Sgl. End, M.D. Thr. 60" Cap. Punch 2" thru 1¼" with Lysholm Table
Type G Clev. Sgle. End, Arr. for M.D. 12" Throat. Cap. Punch 2" thru 1"
Lysholm Double End, M.D. 44" Thrts. Cap. 1-¼" thru ¼" Steel

ROLL-PLATE STRAIGHTEN.
96" Newbold, Arr for M.D. Nine 14" Dia. Rolls. Capacity 1-¼" Plate

ROLLING MILLS
9" Belgian Bar Mill, Consisting of two 3 high roughing stands 12"x54"; finishing stand 2 stands 2 high 9" x 13", 3 stands 3 high 9"x30"
10x9" Acme Four Stand 2 High
10½"x12" UE&F Sgl.. St. 2 Hi.
14"x42" Gar. Sgl. Stand. 2 Hi.
16"x20" Nat. F. Sgl. Std. 2 Hi.
22"x28" Univ. 3 High Mill complete install. incl. motor
19" Morgan 8 Stand Contin. Sheet Bar and Skelp Mill with 3 Stands of Vertical Rolls
24" Mackintosh Merch. Bar Mill, One 3 High Stands. One 2 High Bull Head Stand
30" Morgan 3 High Bill. Mill
44" Bloom. Mill. Consist Pinion Stand, Rol. Tbl. & CatchT.

SAW
Wellman Seaver Hot Saw, Arr. for M.D. 72" Dia. Saw, Capacity 12" Sq. Billets

SHEARS—ANGLE
4"x4"x¾" L. & A. Dbl Angle Shear Arr. motor drive
6"x6"x¾" Hilles & J. No. 2 Dbl. Angle Shear, Arr. M.D.
8"x8"x1" L. & A. Size C Dbl. Angle Shear, Motor Driven

SHEARS—BAR
No. 3 Hilles & Jones Guill.Type, Arr. for M.D. Cap. Shear 3" Round, 2-½" Square. 10"x1¼" Flats 6"x6"x½" Angles
No. 10 Buffalo Armor Plate, Belt or M.D. Cap. shear 3-½" Rounds, 3" Squares, 8"x1¼" Flats, 8"x8"x¾" Angles
74" UE&F Co Bar Shear, Arr. for M.D. Capacity eight 8"x 1-¼" Bars. Complete with 70' Bar Shear Approach Table
Mesta Vertical Open Throat Bar Shear, M.D. 1-¼"x36" Cap. to cut four 1-¼"x8" Cold Soft Steel Sheet Bars. Complete with Tables

SHEARS—GATE
84" Newbold, M.D. Cap. ¾" Pl.
132" Morgan. 7¼" Stroke. Capacity 1-¼" Plate
12" Beatty Mchr. Mfg. Co. M. D. Cap. ¾" Plate

SHEAR—ROTARY
No. 40A Quickwork Rot. Shear, Arr. M.D. Cap. ¼" Plate. Comp. with Circle Cut. Attach.

SHEAR—ROTARY FILING
United Engr. & Fdry. Co., M.D. 1" Rds. up to 4"x3" Flats

SHEAR—SQUARING
96" Bliss No. 465, M.D. ¼" Pl.

STRAIGHTENERS
¾" Hallden No. 2 Strtng.& Cut-off Mch., Arr. M.D. 12' Cut-off
No. Medart. Arr. for M.D. Timken Equipped. Capacity ¼" to 1¼" dia. any length
No. 2 Sutton-Ab. Strtnr. M.D. Cap. Solid Bars 1¼" to 3½" Dia Tubes, 1¼" to 4-5⅛" O.D.
⅛", 3/16", ¼", ½" Shuster Rot.

Good Used Machinery

ARC WELDER—G. E. 200 amp., m.d.

BORING MILLS—Niles 36" c. d. Baush 44" m.d. Bullard 51" Vert., 2 hds., Bullard 42" Mill, vert.; Rockf. No. 2 horiz., 3⅛" Bar; Colburn 42" Vert. 2 Hds.

BRAKES—D. & K., 5' Box & Pan, 14 ga. Keene 10' 16 ga. Toggle Press.

DRILLS (RADIAL)—Mueller 2½', Fosdick 2½', Fosdick 4', Carlton 4' all gear box dr.; Hammond 4' sensitive; Mueller 4½' q. box.

DRILLS (H. S. B. B.)—H & W 2, 4, 5sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Giff. 1-sp.; Avey 2-sp.; Aveymatic 2-sp., m.d.

DRILLS (MISC.)—Baker No. 217 (2) & No. 314 Hvy. Duty; Hamilton 42" S.H.; Barnes 20" & 24" 1-sp. & 20" 4-sp. & 24" 3-sp. all grd. camel back; P & W No. 12 Multi-Sp.; Natco 20-sp. Rect. head.

GEAR CUTTERS—G & E 60" & B & S 26" s. p. d. automatic spur; Fellows 24" gear shaper. Cincinnati 36" gear cutter. G. & E. 48" gear Cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool, B &S Nos. 11&16 pl.Heald Nos.60&65 Int.; Landis 10x30" Plain; B & S 10x48"; 3—Norton 6x32" plain, Heald No. 20 Rotary Surface (3). B & S No. 2 Univ.; Badger No. 220, auto. d. e., opposed disc (4); Modern No. 6 Int.; Brown & Sharpe No. 2 surf.; B. & S. No. 10 pl. self-cont.; Norton 10" x 36"; B. & S. No. 13.

KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M.&M. No. 0; Catlin No. 2. Catlin No. 4.

LATHES—Monarch 16"x10' M.D.; LeBlond 18x8'; Lehmann 18"x9'; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. q; Flather 22"x10'; Bradford 21"x10'; LeBlond 16"x8'; P & W 17"x10'; Gleason 45"x12'; Monarch 16" x 8' (2); Ryerson 20x10', m.d.; Sebastian 20"x14' QC.G. M.D. Grd. Hd.; Mueller 22"x12', S.B.&E. 30"x12' Q.C.G. Cisco 20"x8" Q.C.G. M.D. Grd. Hd.

MILLING MACHINES—B & S No. 1, Cin. No. 1½, Ohio No. 29, Kemp. No. 3 & Brown & Sharpe No. 3 Universal; Dow No. 1, Ohio No. 20, American No. 1½, Becker No. 2, Rockford No. 2, Cin. No. 2, Kemp. No. 3, Cin. No. 3, Hendey No. 3, B & S No. 3, LeBlond No. 3-H, LeBlond No. 4 M.D. C.D. & Cleveland No. 2 S.P.D. Plain, Cin. 24" Auto. Plain; Kemp. No. 33 S.P.D. Prod.; Becker No. 6 and Model "B" Vertical; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Cin. No. 4 S.P.D. Pl. Grd.Hd.

PLANERS — Gray 30"x30"x10' 2 heads; Gray 48"x48"x10'; Gray 28"x28"x6' 1-hd.; Pond 32"x34"x10'; Hamilton 60"x 36"x10', 2 heads.

PUNCH PRESSES—Federal Nos. 1, 2, 3 o.b.i.; Bliss No. 18 & 19; Ferracute No. P-4; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch, Swaine No. 37 O.B.I.; Rockford Nos. 2 & 3; and Verson No. 4 O.B.I; Bliss No. 19½; Michigan No. 4 O.B.I; Niag. No. 4, Niag. No. 5, L & J No. 3, Walsh No. 1, O.B.I.

SAWS (HACK)—Rac. 6x6" h.s.; Rac. 8x8; Peerless 6x6" H.S. (4); Atkins 8x8" Universal Shaping (2).

SHAPERS—S & M, G & E, Ohio, Mi., Q. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, Q. City, Rock, Cin. 24"; Ohio 26"; Cin. 24" s. p. qr. box; Rhodes 3½" Vertical; American 24" heavy, b.g. Amer. 15"; Springf. 15"; S.&M. 26", b.g. G. & E. 24", s.p., gearbox.

SCREW MACHINES—W.&S. Nos. 4, 6, & 8 Hand; Nat. Acme. Nos. 515, 52, 55, 4-sp.; Gridley 4-sp. ⅞"; Automatic, Gridley 4 spindle, 2¼".

SLOTTER—Bement-Miles 10" vert.; Barr 12".

SQUARE SHEARS—Stoll 42", 14 ga.

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES — Bullard 36" vertical, rapid production. Bausch 30" M.D.; Bullard 24" vert. rap. prod.; W.&S. No. 8;

Above is only a small part of our large stock on hand

McDonald MACHINERY CO.
1531-35 N. Broadway ST. LOUIS, MO.

MILES QUALITY TOOLS

AUTOMATICS

1" & 1-⅝" New Brit. 6 spindle
1" Cleveland Mod. J, dbl. end
1¼", 1-¾", 2-⅝" & 3¼ Grid.
1¼" & 1½" Cone 4 spindle
1-⅝", 2" & 2½" Nat. Acme
Nos. 24, 33, 454 & 654 New Britain chucking
18" Gisholt Simplimatics

BROACHES

Nos. 1, 3 &4 Lapointe screw
Twin 10 & No. 3 Oilgear hydr.
No. 2S Lapointe hydraulic
10 ton Metalwood vert. hydr.
2 ton American vert.
No. 3 J. N. Lapointe double

DRILLS

21", 24", 28" Cincinnati
21", 25", 28" Superior
30" Snyder
20" & 24" Barnes all geared
Nos. 121, 217, 314, 315, 321 Baker
No. 2 Colburn, 1, 2, 3, 4, spdl.
24", No. 4 Colburn
15", No. 2 Avey, 1, 2, 3 spdl.
24", No. 3 Avey, 1 & 2 spdl.
16" Fosdick, 1, 2, 4 & 6 spdl.
Nos. 11, 12, 13, 14 & 30 Natco mult. 8 to 48 spdls.
3½', 4', 5' & 6' Western radial
4' Mueller radial
6' N. B. P. univ. radial
No. 15½ Foote Burt Mfg.

FORGING MACHINERY

1½", 2", 2½" & 4" Ajax upsetters
1½" Acme upsetter
No. 1A Ajax forging rolls
No. 3B Nazel hammers
400 & 600 lb. Chambersburg board drop hammers
⅞" No. 3 Manville header
Nos. 25 & 9 W. & W. bulldzrs.

GEAR CUTTERS

Nos. 12HS, 18H, & 24HS G.&E.
Nos. 1 & 5A Lees Bradner
No. 12 Barber Colman
48", No. 4 Brown & Sharpe
28" & 36" G & E automatic
Nos. 2 & 2½ Bilton auto.
Lipe 2 spdl. chamferers
15" Gleason quenching press

GRINDERS

6"x18", 10"x52", 12"x36", 12" x72" Landis
6"x32", 10"x36", 10"x50", 14" x50" & 14"x72" Norton
12"x24" Modern
12"x40" No. 3 B. & S. univ.
12"x36" No. 2½ Bath univ.
No. 2 Norton tool & cutter
No. 184 Greenfield tool & cut.
Nos. 6 & 10A Bryant internal
No. 70 Heald internal
18", 24", 30" & 53" Gard. disc
18" Gardner semi-automatic
No. 96 Gardner hydraulic fd.
No. 84 Gardner, 24" opp. disc
No. 221 Badger, 24" opp. disc
2¼" Wilmarth & Morman drill
1½" & 3" Oliver drill
26" & 36" Blanch. rot. surf.
12"x24" & 12"x36" Diam. sur.
16"x50" Safety Emery surface
14" Pratt & Whitney BB sur.
12", No. 22 Heald rotary
8" & 12" Arter rotary
8" Arter auto. fd. piston ring
Pratt & Whitney worm grind.
National Tool Co. worm grd.
24" Ingersoll milling cutter
No. 524 Mummert Dixon rad.
Osterholm resurfacing grds.
10"x50" Norton cam
10"x27" Bath spline
Gisholt tool
84" Diamond face & edge

ENGINE LATHES

10"x5' Pratt & Whitney
12"x6' Monarch
13"x6' Willard
13"x4' & 13"x5' South Bend
14"x6' Monarch
14"x6' Lodge & Shipley
14"x6' Walcott
15"x6' South Bend
16"x6' Monarch
16"x6' Hendey
16"x6' Cincinnati
16"x9' Lehmann
16"x10' Leblond
17"x8' Leblond
18"x8' L. & S. grd. hd.
18"x9' Chard
20"x8' Monarch
20"x10' Morris geared head
21"x16' Leblond
22"x10' Davis
22"x12' Morris geared head
23"x10' Rahn Larmon
24"x10' LeBlond
24"x10' Boye & Emmes
24"x12' Lodge & Shipley
24"x16' Boye & Emmes
26"x12' Wickes
26"x15' American geared hd.
30"x12' Lodge & Shipley

TURRET LATHES

Nos. 2, 4 & 3A War. Swasey
No. 4 Cincinnati Acme
Nos. 3 & 4 Foster
21" Gisholt
3"x36" Jones & Lamson
Jones & Lamson 2 spindle
No. 4 Bardons & Oliver
2¼"x26" Greenlee
2½"x26" Pratt & Whitney

MILLS, BORING

42" Bullard, MD, PRT
42" Detrick & Harv. MD, PRT
3" Binsee horizontal
5" Barrett cylinder boring

MILLERS

Nos. 3 &4 Cincinnati vertical
Nos. 5C & 6 Becker vertical
Nos. 2, 3 & 3S Cincinnati
Nos. 2 & 3 Kempsmith
No. 4 Kempsmith Maximill
Nos. 1½B & 2B Milwaukee
No. 2 Heavy Brown & Sharpe
No. 2 Rockford
No. 4 Leblond
No. 6 National Transit
No. 35 Ohio universal
6"x14" Pratt & Whitney thrd.
24" Cincinnati duplex auto.
48" Cincinnati automatic
No. 3 Rockford Rigidmil
No. 31 DeVlieg Supermill
No. 21 Brown & Sharpe auto.
36" & 42" Ingersoll cont. rot.
Model C Becker rotary
48" Ohio tilted offset
28", 37" & 42" Briggs
Nos. 1 & 1A Davis & Thomp.
Type 45 Bilton Productomatic
No. 1 American, Lincoln type

PLANERS

24"x24"x8' Rockford
30"x30"x8' Gray
32"x32"x12' Niles
36"x36"x10' Det. & Hy. opens.
36"x36"x16' Cleveland open.
56"x56"x16' Gray

SHAPERS

16" & 24" Gould & Eberhardt
16" Kelly
16" Ohio, 20" & 28" Ohio
16", 20" & 24" Walcott
20" Smith & Mills
24"x24" Cinc. shaper planer
24" Columbia
24" Milwaukee
36" Morton draw out

SHEARS

36"x16 ga. No. 536 Niagara
42"x22 ga. Niagara foot
48"x14 ga. No. UD48 Pexto
48"x3/16", No. 748 Niagara
72"x3/16", No. 872 Niagara
96"x3/16", No. 796 Niagara
120"x16 ga. Bertsch
No. 15 Niagara rotary
30", No. 14 Pettingell rotary
34", No. 1 Gray metal cutter

TAPPERS

Nos. 1, 2, 2X, 2BG Garvin
No. 3 Holmes 6 spdl. tilted
Hammond pedestal & radial
Natco 1 & 2 way lead screw

THREADERS

½", 1", 1½" & 2" Landis dbl.
½" Acme double
½" Webster & Perks double
1", 2" & 2½" Landis single
1½" Geometric single
2" & 3" Acme single

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MILES MACHINERY CO., SAGINAW, MICH.

MACHINE TOOLS

2 spdl. J.&L. Steel Hd., m.d., air chucks
3x36" Jones & Lamson, chucking, m.d.
2 spindle 3x36" J.&L., m.d., chucking
3¼x36" Cincinnati Acme, m.d.
16" Warner & Swasey Plain Turret, cone
18", 20" Acme Turret, cone
18" Type A Libby Turret, m.d.
26" Libby Type C, m.d., 7½" hole, taper
21", 24" Gisholt

SHAPERS

10" Rhodes, Vertical
10" Alba, gear box, new
16" Steptoe, gear box
20" Queen City, cone
24" Barker, cone
24" Cincinnati, cone
24" Rockford, cone
28" Amer. gear box, vee ram ,auto oil

SURFACE GRINDERS

No. 16-26" Blanchard, m.d. on spindle, 25 H.P. motor
No. 25A Heald, m.d., 16" chuck
No. 10U Norton Lapper, m.d.
12x36" Diamond Auto. Surface, m.d.
18x48" Diamond L.D. Face, m.d.
30x84" Diamond H.D. Face, m.d.
54" Bridgeport Knife, belt
60" Bridgeport Face, s.p.d.
6' Reed-Prentice Vertical, m.d.
Springfield Planer Type, m.d.

INTERNAL GRINDERS

No. 3 Bryant Semi-Automatic Hole, m.d.
No. 10 Bryant Semi-Automatic Hole, belt
No. 11 Giddings & Lewis Teromatic, 3m.d.

UNIVERSAL GRINDERS

No. 1 Wilmarth & Morman, belt
No. 2 Brown & Sharpe, belt
No. 2 Landis, belt. 10x18" Landis, belt
16x48" No. 3A Cincinnati, belt
No. 13 Brown & Sharpe, belt
No. 3 Gallmeyer & Livingston, m.d.

PLAIN CYLINDRICAL GRINDERS

6x18" Landis, m.d.
6x30" Norton, m.d.
6x32" Brown & Sharpe No. 11
6x32" Norton, belt
7x72" No. 16 Brown & Sharpe, belt
10x18" No. 14 Brown & Sharpe, belt
10x36" Landis Integral Cam, m.d.
10x36", 10x52", 10x72" Landis, m.d.
10x36" Norton, m.d. 10x50' Norton, m.d.
12x36" Cinc. belt. 16x48" Cincinnati, belt
12x72" Landis, m.d.
12x72" Norton, belt
14x72" Norton, m.d.
16x52", 16x72", 20x144" Landis, m.d.

TOOL & CUTTER GRINDERS

Gisholt Tool, belt
Gould & Eb. Gear Cutter Grinder, belt
No. 1, 1½ Cincinnati, belt
No. 1 LeBlond, two motor drive
No. 1 Wilmarth & Morman, 3 motor drive
No. 2 Norton, belt
No. 2 Lumsden Tub Type, belt
No. 4, 5, 41 Oliver Drill Pointers,m.d.in b.
No. 23 Brown & Sharpe Gear Cutter, belt
Sellers Drill, m.d., 3" cap
Gleason Cutter ,belt
New Yankee Twist Drill, m.d.
18" Cincinnati Face Mill, m.d.

GEAR CUTTERS AND HOBBERS

No. 7 Fellows H.S., m.d.
No. 6, 61, 62, 612, 615 Fellows
Gleason Bevel Gear Tester, belt
6" Gleason Straight Tooth, belt
No. 1 Lees-Bradner Prod. Hobber, m.d.
No. 3, 12 Barber-Colman
No. 3-26" and 36" B. & S. Gear Cutters
No. 3 Heavy Brown & Sharpe, m.d.
No. 3-26" Cincinnati, belt
No. 5A Lees-Bradner, 14" size, belt
No. 6-60 & 6-72" B. & S. Gear Cut., m.d.
16" Cincinnati Gear Hobber, m.d.
36" Gould & Eberhardt Gear Cutter, s.p.d.
Schuch. & Schutte Gear Tooth Rounder, blt.

PIPE MACHINES

No.2 Bignall & Keeler, m.d., 2" cap.
No. 4 Big. & K. m.d., 4" cap.
2" No. 70 Jarecki, m.d.
2" Landis Dbl. Head Pipe & Nipple, belt
2" Merrell, m.d.
2" Saunders, m.d.
4" Eaton, Cole & Burnham, belt
8" Bignall & Keeler, belt

SQUARE SHEAR

KL 10½ Niag., m.d., cap. 10' by⅜",latest

RADIAL DRILLS

4', 5' Amer. Triple Purp., gear box on base
6' Amer. Triple Purpose, d.c. drive on arm
3' American Sensitive, cone
3' Carlton Sensitive, belt
4' Amer. Triple Purpose, d.c. drive
4' Carlton, inclosed head, gr. box on base
4', 5' Dreses Plain, gear box on base
4' Morris Plain, gear box on base
4' Hammond Jack Knife, belt
5' American Triple Geared, gear box
5', 6' Niles-Bement-Pond Semi-Univ.,d.c.dr.
5' Prentice, cone
7' Fosdick, cone
No. 1 Barnes Horizontal, belt

BROACHING MACHINES

Oil Gear, type XB10 Hydraulic, m.d.
No. 1, 2, 3 LaPointe, belt
No. 2, 3 LaPointe, gear box
No. 2, 3 LaPoine Double, belt
15 ton Hercules, m.d.

BORING MILLS—VERT.

10″ Pond, vert. 96″ table; Betts 10 Ft. 16′ Extension type; 72″ Colburn rapid traverse vert. 42″ Bullard, New Era, Side Hd. 24″ Bullard Rapid Prod. Side H. 30″ Bullard & Colburn 42″ Gisholt Vertical 52″ Bausch Vert. 2 heads 84″ Niles Vert. 2 heads

BORING MILLS—HORIZ.

No. 33 Lucas, 4½″ bar. M.D. No. 300 G. & L. 4½″ bar; Beaman & Smith, 5″ dia. sp. 12″ Niles Cyl. Dble. End 7″ Bar Putnam-table type

BRAKES, CHGO. STEEL

Hand—3′16, 4′12, 4′16, 6′16, 8′18, 8′16, 8′14, 10′14, 10′16, 10′18
Bez & Pan—4′, 5′ 14 ga. 4′ & 6′ 10 ga. 10′ 10 ga
Power—10′ 3/16″—12′ 1/4″—12′ 3/16″—10′ 10 ga.—8′12—6′ 10 ga. 6′ 12 ga.

GRINDERS

No. 16 Blanchard″ surf 36″ chk. Heald Rot. Sur., 16″ Mag chuck; No. 3, 4 6. & L. Tool & Cutter; No. 25 Landis Cyl. 24″x144″; No. 96 Norton surf., 72″

IRONWORKERS, UNIVERSAL

Pels No. 20, 6″x6x½″; 4x4½″ Smith No. 91-16, Capacity 6″x 6″x⅜″; with notching attach. Smith No. 91-13, Capacity 4″x 4″x⅜″; with notching attach.

LATHES

Am. Grd. Hd. 18x8; 24x16; 16x8 Bradford; 16x6 P&W; 30x18, 36x30 L&S L&S 18″x 10′ Grd. Hd. M.D. 30′ Pit Lathe, 156″ face plate

LATHES — TURRET

No. 1B Foster, bar feed
No. 4 Warner & S. Univ. M.D.
No. 2-A, No. 3-A Warner & S. 21″ Gisholt

MILLERS

UNIV. No. 3 Kemp, No. 3A B&S.
PLAIN No. 3-B Milw. No. 2-M Cin. Motor in base; No. 4-B Milw. Dble. overarm, M.D.; No 3 Van Norman Duplex—Vert. hd. M.D.; No. 4 Cin. Vertical No. 3 Ryerson-Con. Vert. No. 2 B&S; Becker Nos. 2, 4, 4B, 5B, 6

PLANERS

48″x48″x12′ Belmar, 4 heads 20′ Niles; 26″x8′ Cleve. Opens.

ROLLS

Angle, 4x4½ G&H, M.D.; Exc. 2x2x¼
Wickes, Pyramid Type, with mtr. Drop End Housing, sizes—18″ x1″; 12″x1¼″; 7″x⅜″.
20′ Cov. Cap. 1½″
6′ Bertsch 42″

RADIAL DRILLS

American 24″; 4′; 6′; West. 6′; 5′ Fosdick Econmax, Mt. on arm 3′ Fosdick

SCREW MACHINES

Natl. Acme Gridley Automatics 3″&4″, 4 spindle, with motors

SAWS—FRICTION

Ryerson No. 0 No. 1, No. 2

SHAPERS

G.&E., Invincible, 32″, 28″,24″ Cin. 20″, 16″; 24″ Am. & Mil. Slotter, Vert. 6″ Pratt & Whitn.

INTERSTATE'S

Latest Catalog No. 404

Describes over 2000 machines in stock—READY FOR IMMEDIATE SHIPMENT.

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SHEARS

Thwaitless, Marsh. No. 10P, No. 112M; ¼ & ½″
13′ ⅜″ and 10′ ⅜″ United
Cincinnati, Chicago Steel,Bertsch, Niagara, 10 Ft. 3/16″.
Niagara 10′ 1″ 18″ gap.
10′ 10 ga. Bliss, 8′⅜″ Beatty
10′ 10 ga. Streine.
Nia. 10′ 10 ga. M.D.; 5′ 10 ga.; 3′ 10 ga.;
No. 1410 Cin. 10′ 3/16″—gap 24″ M.D.
12′ ⅜″ Beatty Gap

PRESSES, Toggle

Bliss Nos. 5, 5A, 3½B, 3½, 1½; Toledo Nos. 268½, 168½″ 164; No. 99 Stoll;

PRESSES, Hydraulic

400 ton; 100 & 200 ton Litchf.

PRESSES, HORN

No. 10—6 Minster M.D.; Nia. Nos. 15, 116,
Bliss Nos. 39, 40, 21,
Toledo Nos. 14, 42, 41A, 43P

PRESSES, Straight Side

No. 78½, No. 77½ Bliss
No. 59 Toledo 18″ stroke
No. 305 Bliss—6″ st. (3)
No. 66 Consolidated, 8″ stroke

PRESSES, Double Crank

No. 92H Toledo 72″ between
Bliss No. 8A Tie Rod; No. 23A
No. 68-B Niagara, Air Cushion No. 796½-B Tol., Tie Rod 25″ st. No. 499 Bliss Toggle 108″ bet. No. 163-A Cons.

PRESSES, O.B.I.

Nos. 1, 2, 3, 4, 6, 6½
Bliss Nos. 20, 21, 102 dbl. crk.

MISCELLANEOUS

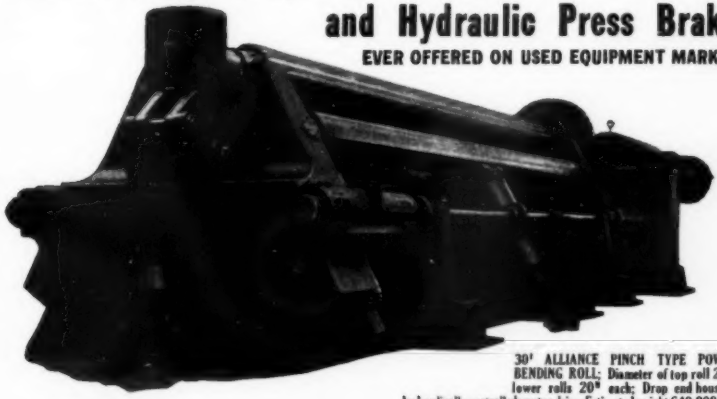
Air Compressors — 12x7x10 Chgo. Pneu. 67 H.P. Synch. Motor built in flywheel, 354 CFM
Bulldozer, No. 4 L&A 16″ str.
Drill, Mult. sp. No. 13 Nateo
Hydraulic Scrap Baler—150 lb. bales, Galland & Henning, 66″x16 1/2″x24″ Chamber.
Flanger ¼″ McCabe
Nibblers: No. 236 Gray 36″ th. No. 2B Campbell ⅜″x30 thr.
Press Brake—10′10 ga. Ohl
Presses, Knuckle Joint Embos. 600 Ton Waterbury Farrel No. 7
Z. & H
Gang Punches, Bertsch, 48″ betw. housings; No. 32 Williams & White
Punches, sgle. end 72″ thr. 2″x 1″ cap.; 36″ throat cap.1¼x1″
Slitters, Gang 24″ 32″ 36″ 48″
Welders, Spot 5, 7½, 10, 15, 20 KW
Slotter, Vert.—6″ Pratt & W.
Welders, Spot 100 KW Federal 5, 7½, 10, 15, 20 KW

SPECIALLY PRICED BEFORE MOVING

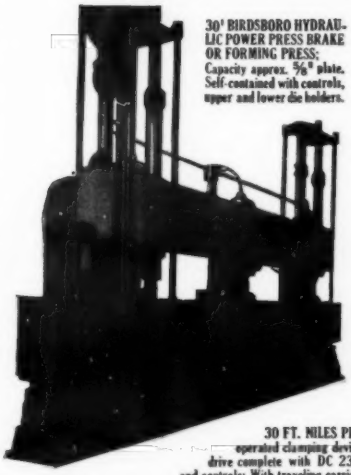
THE MOST MODERN MOTOR DRIVEN

Plate Bending Rolls, Plate Planer and Hydraulic Press Brake

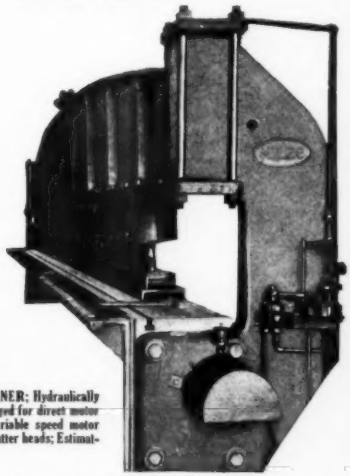
EVER OFFERED ON USED EQUIPMENT MARKET



30' ALLIANCE PINCH TYPE POWER BENDING ROLL; Diameter of top roll 26"; lower rolls 20" each; Drop end housing. hydraulically controlled; motor drive; Estimated weight 640,000 lbs. ALSO 20 FT. ALLIANCE PINCH TYPE POWER BENDING ROLL; Similar Construction.



30' BIRDSBORO HYDRAULIC POWER PRESS BRAKE OR FORMING PRESS; Capacity approx. 5/8" plate. Self-contained with controls, upper and lower die holders.



30 FT. NILES PLATE PLANER; Hydraulically operated clamping device; Arranged for direct motor drive complete with DC 230 volt variable speed motor and controls; With traveling carriage and cutter heads; Estimated weight 180,000 lbs.

WRITE, WIRE OR PHONE FOR PHOTOS AND DETAILS.

INTERSTATE MACHINERY CO.

1449 W. Pershing Rd., Phone YARds 5800 Chicago, Ill.

BORING MILLS, Horizontal

3½" Bar P & H No. 12 Floor
5" bar Niles - Bement - Pond, Knee Type, Rotary Table
6" bar Barrett Cyl. Borer
4" bar Gisholt, knee, M.D.
8" bar Beaman Smith, Floor

BORING MILLS, Vertical

10'-16' Niles Ext. Type M.D.
72" N. B. Pf. P.R.T. M.D.
72" Colburn, P.R.T. New.
60" Betts, M.D.
48" Gisholt, P.R.T., MD.
44" Putnam, P.R.T., M.D.
44" Bullard, Maxi-Mill P.R.T.
42" Bullard, P.R.T., M.D.
36" Bullard Rapid Pro.
30" Colburn, 1 Turret Head..

DRILLS, Radial

6' Mueller, Gear box, M.D.
6', 4' & 3' Cinc. Bickfords
21", 24", 26" Cinci. Bick.
3' American, Sensitive.
5' Amer. Tri. Pur. Mo-on-arm.
5' - 6' Amer. Tri. Grd.
2 spindle Allen M.D.
4 Spindle No. 2B Edlund.
4 Spindle Kokomo, No. 3 M.T
24 spindle Bausch No. 2 M.T.
No. 22½ Foote Burt.
26" Barnes Camel Back (5)

GRINDERS

8"x54" Fitchburg Pl., m.d.
10"x52" Landis Plain.
16"x50" Norton Self Cont.
No. 6 Bryant Chucking
12"x48" Diamond Surf. No.3
16"x80" Cinci. Cyl. M.D.
18" Besly No. 26 Disc.
24" Besly Disc M.D.
18" Badger No. 220 Disc.
20"x96" Landis
No. 11 Landis Tool & Cutter.
No. 33 Abrasive Surface.
No. 55, 60 and 65 Heald Cyl
1¾" New Yankee Twist Drill Heim, Centerless.

LATHES

12"x6' So. Bend L.C.G. Cone.
14"x6' Cisco t.s., draw-in.
14"x6' Monarch, q.c.g., cone.
16"x6' So. Bend, L.C.G. Cone.
16"x8' Lodge & S., M.D.
16"x8' Simplex Q.C.G., Cone Pan.
16"x8' Prentice, Grd. Hd.
16"x10' Mona'h L.C.G. Cone.
17/19"x10' Sidney Q.C.G.
18"x8' Amer. Grd. Hd. (2)
18"x8' Walcott Q.C.G., Cone
18"x8' Barnes L.C.G. Cone.
18"x8' Lodge & S. Cone.

LATHES (Continued)

19"x8' LeBlond, Cone.
20"x12' Greaves K., T.A.
20"x12' New Haven, T.A.
22/24"x8' Lodge & S., cone.
24"x10' American Cone
24"x14' Schumacher Boye Q. CG., Cone
24"x19' American L. C. G.
24"x14' L & S T.A., Cone
25"x12' LeBlond, Q. C. G. Cone, T.A.
26"x10' Pond, Q.C.G., Cone.
28"x12' Boye & Emmes.
28"/50"x10' Ran-Larmon Gap
30"x13½' N.B.P. Grd.Hd.,M.D.
30"x16' N.B.P. Axel & Journal, Center Drive, M.D.
30"x14' Putnam Axel, Center Drive, M.D.
30"x25' Pond L.C.G. Cone.
32"x17' Fifield, triple grd.
36"x14' Pond, Grd. Hd., M.D.
36"x15' Putnam Grd.Hd.,M.D.
36"x22' Bridgeford, M.D.
36"x24' Bridgeford, M.D.
42"x20' L. & S. Cone, Q.C.G.
42"x30' Johnson Grd.Hd.M.D.
42"x40' N.B.P. Grd. Hd.
48"x36' Fifield, m.d.
90" N.B.P. Heavy, Wheel

MILLERS

No.. 2 Hendey Univ. Cone,MD.
No. 6 Becker Vertical.
Model C Becker Vert. S.P.D.
Model C8 Becker Continuous.
No. 6 Jackson Die Sinkers (3)
No. 4 Cinci. Pl. Cone.
No. 4 Cinci. Univ., Cone
No. 4 LeBlond Pl. Cone M.D.
No. 3 Kempsmith Pl. Cone.
No. 2 Cinci. Univ. High Power Geared Head, S.P.D.
No. 2 Cinci. Pl. Cone M.D.
No. 2 Knight Vertical
18" Cinci. Duplex 24" & 36" Sundstrand Rigidmills (2).
24"x24"x12' Ingersoll Adj. Rail Planer Type M.D.
28" Cinci. Semi. Auto.

PLANERS

48"x48"x12' D&H Openside.
48" x 48 x 10' Gray, 2 Hds.,
48"x36"x10' Gray, 2 Hds.
36"x36"x20' Chandler 4 Hd.
24"x30"x6' Cinci., 2 Hds.
36" Newton Rotary, M.D.
30"x30"x10' D. & H. Openside.
30"x30"x8' Powell 2 hds.
27"x27"x6' W. & P., 1 Hd.
24"x8' Gray; 24"x7' Niles.
24" Lynd Farquhar Openside.

TURRET LATHES

3¼"x36" Cincl. Acme. Grd. Hd.
No. 1 Cincinnati Acme Semi-Univ. Timk. Bear., M-in-B.

TURRET LATHES (Continued)

No. 5 Foster, 1-13/16" bar.
No. 6 Foster, 2-¼" bar.
Nos. 9 & 2 Bardons & Oliver
21" Gish. 3½" H.S., 2 cone
24" Gish. 6½ H.S., 2 Cone
28" Gisholt M.D.
2¼"x24" & 3"x36" J. & L.
No. 4 W. & S. Univ. Cone M.D. (2).

MISCELLANEOUS

Automatic, 24" Gridley, 1 Sp.
Billet Breaking Mach., Ajax.
Bolt Threader, 1¼" Landis.
Bolt Threader, 2" Landis.
Broach, No. 2 Lapointe Belt.
Chucking, Nos. 34 & 23 N. B.
Die Sinkers, No. 6 Jackson (3).
Flanger, ¼" McCabe Pneu.
Gear Cutter, 110" Newton Spur
Gear Cutter, No. 13 B. & S.
Gear Gen. 11" Gleason Bevel
Gear Planer, 24" Gleason.
Gear Hobber, 6" Pfauter.
Hammer, No. 2B Nazel, M.D.
Header, 1¼" Acme Rivet.
Header, 2" Acme, Steel.
Keystrs., No. 1 Bak., No. 1 Dav.
Keyseat., Nos. 2, 3 & 4 M&M
Pipe Mach. 4" Landis, M.D.
Pipe Mach., 8"x12" Williams
Pipe Machine, 12" Saunders.
Pipe Mach., 12" Curtis & C.
Pipe Mach., 2" Bignall Keeler.
Press, No.8½ Z & H Percussion
Press, Forcing 50 ton Lucas
Press, No. 61 Spec. V & O.
Presses, No. 18 Bliss B. & Fl
Punch & Shear No. 47 PBC B.
Punch 54" H & J No. 2 D.E.
Punch, 36" Whit. ¾"x½".
Rolls, 8"x½" H&J No. 2.
Saw, No. 3 Ryerson Frict. D.C.
Saw, 9"x9" Peer. Hack, M/D.
Saw, 6" Avey Milband.
Saw, 6" Gorton No. 2B Inter.
Saw, 12"x15" Racine M/D.
Saw, 6" Peerless Univ. M.D.
Shaper, 16" American, Cone.
Shaper, 24" Gould & Eberhardt
Shapers, 24" & 20" Queen City M.D.
Shaper, 16" Ohio, M/D.
Shaving Mach. P. & W. Vert.
Shear, 8"x¼" H.&J. No. 2 12" gap.
Shear, 30" Cleveland, No. X.
Shear, 156"x¼" United, 36" g. 126"x¼" Amer., 22" Gap.
Slotter 15"-18" Dill.
Slotter, 24" Dill A.C., M.D.

"Burns Best Bargains"

AIR COMPRESSORS
Ingersoll-Rand 12x8 pres. 50 lbs.
Sullivan, 10x8 horiz. type W.G. 6, 50 lbs. pressure.
Bury 6x6 single class L.

AUTOMATICS
Gridley 4-spdl. Mod. F, 3/4" 1 1/4".
Cleveland, 1/4" Model B, 2" Model A, 5-hole (4).
Cone 1" 4-sp. straight line cut-off M.D.
Gridley, 2 1/4" single spindle..
Acme, No. 53—1" 4-spindle.
New Britain No. 24 chucking with tapping attach.
New Britain 1x5, 6-sp. M.D.
P. & Whitney 1 x 8 Auto. Lathe

BORING MACHINES
Barret Hor. Boring Bar, 3 1/2".
Barnes No. 1 horiz. dbl. sp. Boring & Drilling (2).
Moline No. 5 hole hog, 6-sp. SPD.
Betts 3" spindle

BRAKES
Brake, Dreis & Krump 4' box & Pan, cap. 16-Ga.
Dreis & Krump 6' hand, cap. 16 ga.

BROACHING MACHINES
LaPointe No. 1, No. 2, No. 3-B.

DRILLS
Colburn No. 4D heavy duty, comp. table, S.P.D.
Aveymatic, 2 Sp. M.D. pump & tank, 12" overhang.
Avey No. 3 8-Sp. P.F. M.D.
Avey No. 3 2-sp. P.F. M.D.
Leland-Gifford 2 Sp. P.F. on one Spd., M.D.
Leland-Gifford 2 Sp. P.F. on each Spd. M.D
LeL. & G. 3-sp. (1) tap. M.D.
Barnes 4 Spd. all geared, self-oiling, 20". M.D.
Allen Hor. P.F. on ea. spdl. M.D. (2).
Henry & Wright 3-sp. M.D.
Sundstrand Hor. Center. & drill.
Barnes, 20"—4-Sp. morse taper No. 4. P. F. on each Sp.
Leland & Gifford 4-Sp. H.S. B.B. equipped with tapping chuck on each spindle.
Bausch No. 4 Mul., 28" Sp.B.D.
Nateo, No. 11, 12-sp. No. 1 taper, P.F. B.D
Nateo No. 30, rect. hd. rotary table, M.D.

RADIAL DRILL
Fosdick 2-1/2'-9" round column G.B.D.

GEAR HOBBERS
Fellows, No. 6

GRINDERS
Heald, No. 60 Internal B.D.
Murray, Disc 24"discs, disc press.
Bryant, No. 10 chucking.
Van Norman No. 3 1/4 Automatic Internal Radius B.B.
Ingersoll cutter Tub (2).

HACK SAWS
Peerless 6x6 H.S. B.D.
Marvel No. 5 H.S. B.D.
Racine 12x12.
Racine 6x6.

HAMMERS
Bradley 100 lb. short helve
Mayer 100-lb. trip.
Niagara 200 lb. board drop.
3-A Hi.-Speed, arr. for M.D.

LATHES
Chard 18"x8' qk. chg.
Porter-cable, 9x14 grd. hd.
Sunstrand, 9x24 Mfg.grd.hd.M.D
LeB. qk. chg. cone hd. 24"x16'
Schumacher-Boy qk. chg. 24"x 16' cone-hd.
McCabe double spindle 26x48x12'
Lodge & Shipley Grd. Hd. 30"x 16' qk. chg. arr. for M.D.
Fifield 40"x12" loose-change.

"SPECIAL"
Univ. 2-1/4" horiz. bor., drill. & Mill. Mach. S.P.D.
W. & S. No. 2-A Univ. M.D.
L. & S. 30"x16' grd. hd. qk. chg. arr. for M D.
K & T No. 1-1-B pl. Miller, dbl. over-arm S.P.D.
K & T No. 1-A Mfg. pl. Mill., dbl. over-arm S.P.D.
P & W. 1x18 Auto. Lathe

MILLERS
Ingersoll 24x24x10', two side hds., one hd. on rail M.D.
Pratt & Whitney No. 4 vert. Die Sinking, equip. with cherrying attachment.
Steptoe No. 0 hand, U. S. No. 1 hand M.D.
Barnes 4-cyseat planer type, vert.sp.

PRESSES
Robinson No. 40-B D.C. stroke 4"—40" wide
Consolidated No. 55 Trimming, side shear, F.W.T., MD.
Niagara, 5-S dbl. action Cam.Grd.
Beatty No. 2 single end, 6' M.D.
Williams & White No. 13 single end grd. 36" throat, M.D.
Rock River No. G-15 single end 16" throat.
Cameron, No. 30 arch F.W.T.
Niagara, No. 13 horn. F.W.T.
Kling, No. 4 single end, 15" throat grd.
Kling No. 2 single end, 19" throat F.W.T.
Bliss No.18, No. 19, No. 21 inc. f.w.t.
Bliss, No 269 toggle joint kick.
Bliss No. 3-B Toggle single grd. 8" str.
Bliss No. 68 dbl. action F.W.T.
Zeh & Hahnemann No. 8 power percussion str. 8".
Toledo No. 52 Arch.
Adriance No. 45 dbl. action cam
American No. 5 f.w.t
Toledo No. 6 grd. Inc.
Tol. No. 14-1/2 horn, sw. th. M.D.
Toledo No. 5-A inc. M.D.
Toledo No. 4 grd. M.D.
Toledo No. 4 plain, F.W.T.
Willard No. 6-A Inc. f.w.t.
200-ton hydraulic tire.
Dunning & Boschert hyd. 50-ton cap. 20" str.
Barnes Screw (2)

PLANERS
Gray 24x24x6', one head.
Woodward & Powell, 30x30x8.

SHAPERS
Milwaukee 24" bk. grd. C.D.
G & E 20" bk. grd. C.D.
Potter & Johnson 15"
Walcott 16" bk. grd. M.D.
Hamilton V-ram, M.D.

SHEARS
Pexto, No. 276 circular 16" thrt.
Pexto, slitting 18" throat.
Pexto, No. 255 slitting 18" thrt.
Swaine, slitting 16" throat.
Badger, No. 27 power splitting blade 12"
Niagara No. 296 power, length of cut 96", cap. 1/4 B.D.
Niagara No. 772 power, 15" gap, cap. 3/16, lg. cut 72". B.D.
Niagara, circular 34" throat.
Rapid No. 25 power circular.
Quickwork, rotary 60", cap.14-ga.
Yoder rotary 60", cap. 14-gauge.
E. & K. 8' power cap. 16 Ga.
Pexto 30", 36" foot power cap. 18 ga.

TURRET LATHES
Steinle 24" Grd. Hd. M.D. 6 1/4" hole in spdl.
R. & S. No. 6 Hd. M.D., pwr. fd.
Warner & Swasey No. 7, fr. hd.
Greenlee, flat turret.
Dreses 16x5' fox.
Warner & Swasey's, No. 1, No. 2, No. 2A Univ., No. 4, No. 6.
Pratt & Whitney 1-1/2"x18" cap. P.F.
Pratt & Whit. 1"x14" P.F. (3)

WELDERS
Agnew No. 10-D type D.
Todd twin arc, H.P. 7, 150 amp.
Dyer 2 1/2 KW bench type.

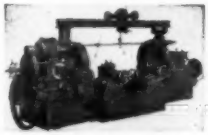
WIRE STRAIGHTENER
Wells, cap. 3/8" and 1/4".

MISCELLANEOUS
Rock River No. 9 horiz. bending & straight. all steel const.M.D.
Bliss No. 119 thread roller.
Betts Die Slotter 16" throat
Brown & Sharpe hob grind. at.
Oster No. 300—pipe threading machine cap 2".
Consolidated No. 3 double seaming machine.
Blakeley metal parts washers (2)
Roots No. 5 1/4 horiz. pres. blower.
Keller E-4 Auto. Profiling Mche. for die sinking.
Garvin Die Slotter.
Niles Die Slotter 36"
Erie Steam Hammers, 800 lbs., 1000 lbs., 1500 lbs.

WIGGLESWORTH MACHINERY CO.

199 BENT STREET, CAMBRIDGE, MASS.

Cable Wigmachine



PUTNAM 48-INCH STANDARD CAR WHEEL LATHE

CONDITION LIKE NEW

CAPACITY:
- Turns Wheels with tread dia.....24" to 44"
- Maximum distance between faceplates.....109"
- Maximum size journals (M.C.B.).....6" x 11"

HEADSTOCK AND TAILSTOCK:
- Main spindle diameter and length front bearing .....16" x 18"
- Main spindle diameter and length rear bearing .....10" x 14"
- Internal spindle diameter .....11"

CARRIAGE:
- Length of bearing on bed.....28"

Machine **New** in 1927

FEED:
- Amount of Feeds ⅛", ¼", ⅜", ½"

D. C. MOTOR DRIVE:
- Driving Motor 35 HP, 550 volt 55 Amps., 400-1200 RPM
- Faceplate Speeds .8 to 2.4 RPM
- Tailstock Traverse Motor is 5 HP, 550 volt, 8.1 Amps. 1150 RPM
- All starting equipment for motors.

MACHINE TOOLS IN STOCK AT PRESENT

AUTOMATICS

No. 00 Brown & Sharpe Screw Machine.
No. 53 National-Acme 4 spdle.
3¼" Single Spdle. Gridley, Model L.

DRILLS

2, 3 or 4 spdle. drills.
21" Cincinnati Sliding Head.
No. 3 Avey Ball Bearing Upright.
26" Barnes Sliding Head.
No. 11 Pratt & Whitney Multiple.
No. 12 Pratt & Whitney Multiple.
3½' Western Radial, M.D.
6' American Radial, S.P.D.

GRINDERS

No. 1½ Landis Universal Cylindrical.
No. 55 Heald Cylinder.
No. 12 NEW Gallmeyer & Livingston Tap.
14" Pratt & Whitney Surface.

LATHES

15"x7' Seneca Falls Tool Room.
16"x8' Hendey, q.c.g.
18"x9' Chard, Semi-quick-change.
18"x12' New Haven, l.c.g.
20"x10' Hendey, q.c.g.
22"x20' Flather, l.c.g.
24"x12' American, Gd. Hd.
32—64"x11' Fay & Scott Gap. Q.C.G.

MILLERS

No. 1½ Knight Vertical.
No. 1½B Kearney & Trecker Universal
No. 2 Brown & Sharpe Universal (2).
No. 3B Brown & Sharpe Plain.

PLANERS

30"x30"x10' Whitcomb Second-Belt.
38"x38"x9' Flather, 2 heads.
42"x42"x10' Detrick & Harvey O.S.
48"x48"x32' Detrick & Harvey O.S.

PRESSES

No. 1½ Bliss Cam-Action Drawing.
No. 3 V & O Geared M.D. Inclinable.
No. 4 N-Bliss, Geared M.D.

TURRET LATHES

24" Bullard New Era Vertical, M.D.
No. 2 Warner & Swasey Hand Screw.
No. 3 Warner & Swasey Fox Type.
No. 5 Foster, Timken Bearing, M.D.
10" 2-spdle. J & L. Steel Head.
No. 5A Potter & Johnston Automatic.
No. 10 Bardons & Oliver, M.D.
24" Steinle, s.p.d., 6¼" hole.
26" Libby, s.p.d., 7½" hole.

MISCELLANEOUS

12', ¼" capacity, DREIS & KRUMP Power Apron Brake, M.D.
11" Gleason Bevel Gear Generator.
No. 15 D.E. Whiton Spur & Bevel Gear Cutter.
No. 3—26" Brown & Sharpe Spur Gear Cutter.
No. 2 Garvin Automatic Tapper.
9"x9" Peerless Hacksaw, M.D.
No. 17 Foote-Burt Rail Drill.
No. 4 Hilles & Jones Double End Punch & Shear, 36" throat.
No. 20 Waterbury-Farrel Threadroller.

All machines are GUARANTEED and offered f.o.b. cars or f.a.s. Boston. Direct water shipment from Port of Boston. We would like to receive your inquiries for all types of machine tools.

QUICK DELIVERY

AIR COMPRESSORS
528' 14 x 12 ER-1 Ing. Rand
511' 15x9x10 Chi. Pneu. O-CB

BOLT CUTTERS
3" Landis, geared mtr. dr.
1¼" Landis, lead screw

BORING MACHINES
10' Betts Vert. mtr. dr.
90"-12' Betts Vertical
72" Pond Vertical
24" Bullard Rapid Prod. Vert.
3—2-3" Sel. Horiz., knee type

CRANES
15 ton 50' span Shepard
15 ton 40' span Niles OET
5 ton 28' 1¼" span Roeper

DRILLS
8' Sellers Radial, mtr. dr.
6' Mueller Semi-Univ. Radial

GRINDERS
3' American Radial
240"x96" Norton Pl., mtr. dr.
10"x36" Cin. Univ., belt dr.
10"x36" Landis Pl. Self-Cont.
10"x24" Landis Self-Cont.
30"x84" Diamond Face Grind.
No. 72A5 Heald, hyd. feed
No. 70 Heald Internal Grinder
7-8"x16" Sichel Hob Grinder
12"x12"x36" Diamond Surface
No. 2 Sellers Tool Grinder, m.d.
8" Heald Rotary Surface
No. 2 Sellers Drill Grinder
Sellers Drill Point Thinner

HAMMERS
300-ton United Engr. Steam Fg.
1400 lb. Sellers Steam Forging
600 lb. N.B.H. Single Fr. Forg.
300 lb. Sellers Steam Forging

LATHES
84"x40' Niles Dbl. Hd., m.d.
20"x8' Prentice, geared head
18"x16' L. & Ship., QCG, CD
16-18½"x8' Lodge & S., grd. hd.
14"x6' Brad., QCG, tap., rev. and draw in attach.
24" Steinle Tur., 6½" spdl.
24" Gish Turret, 6" spindle
2—No. 6 (2") Wood Tilt. Tur.
No. 6 Brown & S. Turret Lathe
3—No. 4 Millholland Turret
No. 4 B. & S. Turret Lathe
No. 4 W. & S. friction head
9—No. 2 W.&S. p. f. to turret
No. 3 14" W.&S. Fox Lathe,CD
2—American Fox Lathes, CD
2—Bardons & O. Auto. F. L.
11—3½" Grid. Sgl. Spdl. Auto.
13—2½" Grid. Sgl. Spdl. Auto.
2—1-2" Four-Spdl. Gridleys
¾-4" Cleveland Model A

MILLING MACHINES
No. 3½ Pratt & W. Dble. Spdl.
No. 2M Potter & J. Mfg., SPD
No. 4 Cinc. Plain Miller
Whitney Geared Hand Miller
11"x24' Milled Screw Co. Thd.
No. 27 Smalley Gen. Thd. Miller, 18" pet chuck, 39" deep, 10" hollow spdl.
2—No. 23 Smalley Gen. Thd. Millers, 6" spindle

PLANERS
72"x72"x32' N.B.P., 4 heads
54"x54"x15' Sellers, 3 heads
36"x36"x14' Hamilton, 3 hds.
40' Sellers Plate, mtr. dr.
30' Niles Plate Planer, m.d.
22' No. 2 Hilles & J. Plate Pl.

PUNCHES & SHEARS
Camden Dbl. End, stl.fr.,45"th. Pels, Rlums No. 26, 24" thr.cap. 1-3" thru 1", arch. jaw
No. 6 Hilles & J. Angle Shears

SLOTTERS
72" Newton Vert. Pl. mch.,m.d.
18" Bement Crank Slot., m.d.

MISCELLANEOUS
10'x2" Teal Pyr. Roll, drop end
No. 504-42" Newt. Cold Saw,12"
6,000 lb. Auto Trans. 72" Tier

ROLLING MILLS
16" x 24" 2-Hi Bliss Duplex Mill, 250 HP motor and gear reluction
16" x 24" Bliss Revers. 2-Hi Cold Strip Mill, 350 HP 440 V. AC mtr.
3-Stand 10" x 12" Bliss 2-Hi Cold Roll Strip Mill, 75 HP mtrs.

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GRINDERS, 78 W. & M., Surf., M.D.

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MILLERS, No. 6 Becker Vert. with ball bearing countershaft; No. 3H LeBlond heavy duty pl.

MONITOR LATHE, 16' Dreses, universal, with chasing bar.

PLANERS, on rail; 36"x15' Betts, 2 heads.

PRESSES, No. 1 Bliss Cam Drawing Press, (2) No. 3 Minster.

SCREW MACHINES, No. 4 Foster cone head; 1½"x9'; Acme cone head.

SHAPER, single Pulley drive.

TURRET LATHES, 21" Libby and 21" Gisholt, (3).

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16" x 6' Lodge & Shipley Grd. Hd. M.D. 12 speed.
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18" x 8' Lodge & Shipley Grd. Hd. M.D. 12 speed.
20" x 8' American Grd. Hd. 8 speed.
20" x 8' American Grd. Hd. 12 speed, Motor in base.
24" x 12' Monarch Grd. Hd. Drop levers in apron.
26" x 12' Bridgeford Grd. Md. Motor drive.
26" x 18' Bridgeford Grd. Hd. Motor drive.
30" x 10' American Grd. Hd. 12 speed, M.D.
30" x 16' American Grd. Hd. 12 speed, M.D.
30" x 24' American Grd. Hd. 12 speed, M.D. 2 carriages.
4' American Triple Purpose Radial, Motor Drive.
No. 16-26" Blanchard Grinder, Motor on spindle.
No. 4B Milwaukee Double Overarm Plain Miller, Arr. M.D.
48" x 48" x 16' Pond Planer, H.D. 4 Heads, Arr. M.D.
No. 3A Warner & Swasey Turret Lathe, S.P.D.

Lathes

14"x6' & 16"x6' LeBlond 3 S.C.D. D.B.G.
19"x8' Le Blond, Q.C., 3 S.C.D.
21"x10' LeBlond, 3 S.C.D. D. B. G.
25"x16' LeBlond, 3 S.C.D., D.B.G.
20"x8' American, 3 S.C.D. D.B.G.
20"x16' American, 3 S.C.D. D.B.G.
18"x24' Lodge & Shipley Engine Lathe.
30"x16' Lodge & Shipley Cone Q.C.
30"x30' Lodge & Shipley, Q.C.
20"x10' Hendey Cone Q.C.

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24" Kelly Shaper, Cone drive.
24"x24"x6' Gray Planer.
36"x36"x14' Detrick & Harvey Openside
26" Whipp Openside Crank Planer, S.P.D.
16, 20, 24" G & E Shapers, cone drive.
16, 20, 24 and 28" Gould & E. Shapers, S.P.D.
16" Ohio Crank Shaper, Cone drive.

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3½', 4', 5', 6' Amer. Triple Geared S.P.D.
4', 6' American Triple Purpose S.P.D.
6' American Trip. Purpose, M.D.
2-3' Mueller. S.P.D.
2½' Cincinnati Bick. S.P.D.
21", 24" Cinc. B. Upright Geared Feeds.
24" Barnes Upright B.D.

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No. 12H Gould & Eberhardt S.P.D.
No. 18HM Gould & Eberhardt S.P.D.
No. 11 B & S spur and bevel Gear Cutter.
Gleason Spiral Bevel Generators and finishers.
50" Rhenania Gear Hobbing machine, C.D.
No. 1 Cross Gear Tooth Rounder.

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No. 4 Cinc. H.P. Cone Univ. 3 S.C.D., D.B.G.
No. 2 Kempsmith Univ. Vert. Hd.
No. 2 Kempsmith Cone, M.D.
No. 3 Kempsmith Universal Cone.
No. 2 Hendey Universal S.P.D.
No. 3 LeBlond Plain 3 S.C.D.

Grinders

New Schuchart & Schutte Hob Grinder (Barg).
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No. 16 Brown & Sharpe Plain.
Diamond Face Grinder.
No. 1 Diamond Surface Grinder.
No. 50, 550, 60, 65, 70 Heald Internal.
No. 75 Heald Internal.
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10"x36" Landis Plain, S.C.
12" Pratt & Whitney Plain Surface Grinder.
53" Besley Ball Bearing Vert. Spindle Disc.

Boring Mills

42" Bullard rapid production, 2 heads.
48" Bullard Cone.
60" Gisholt, P.R.T.

Turret Lathes

No. 7 Foster Universal Turret Lathe.
No. 4 & 6 W & S Plain Cone Drive.
25" Le Blond Full Turret Lathe.

Miscellaneous

2½" Landis Bolt Cutter.
No. 4 & 5 Mitts & Merrill Keyseaters.
Model W Cleveland Pch. & Shr. 60" thrt., M.D.
8'x¼" Chicago Bending Brake.
6'x3/16" Chicago Bending Brake.
No. 92D Toledo D.C. Press.
No. 4A High Speed Riveter New.
2—No. 35 Niagara Presses New.
No. 36 Niagara Press New.
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6"x6" Peerless Shaping Saw.
8'x3/16" Capt. Toledo Power Squaring Shear, Gap.
35 K. W. Federal Spot Welder.

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28"x10' Hamilton Lathe, Q. C. G. Cone.
24"x10' Swings 27½" Greaves-Klusman, Q. C. G. Lathe, 20" 4 jaw chuck, Cone.
20"x8' Hamilton Lathe, Q. C. G., T. A., Cone.
No. 2A Brown & Sharpe Universal Mill.
2¼" Acme Turret Lathe, Wire Feed Cone.
16"x42" Landis Crankshaft Grinders, Self-contained Countershafts, Motor Drive.
No. 2 Morse Universal Grinder 12"x30".
No. 4 Landis Universal Grinder 12"x66".
16" G. & E. Shaper, Cullman, Motor Drive.
12"x42", 12x52" Landis plain Grinders.
4½' Morris Radial, Gear Box, S. P. D.
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3½' Morris rad. A. C. Mtr. Dr.
4 spindle L-G No. 2 M. T. p. f.
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1, 2 & 3 Sp. Allen, P. F. & T. A.
1 & 2Sp. Demco, H.S.B.B.
20" Barnes all-grd. self-oiling.
28" Cin-Bick. Tap. Att., Gr. Box.
No. C-5 Natco, 10 spindles.
No. 13 Natco, 16 Spindles.

GRINDERS

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No. 7½ Gardner, 30" Disc, B.B.
No. 3 Wil. & Mor. auto., surf.
No. 78 W. & M. Auto. Surf. B.D.
No. 2 Brown & S. surface, b. d.
No. 70 Heald Int., clutch in hd.

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16" American 8 Spindle Grd. Hd., Q. C. G., S. P. D.
16x6' Prentiss Q.C.G.
16"x6' Hendey QCG, Tap. Att.
18"x6' Milw. Semi. Q.C.G., B.D.
17"x6' Milw. Semi Q.C.G.
18"x8' Springfield, Q. C. G.
20"x42" Fay & Scott Ext. Gap.
24"x12' Schum. Boye q. c. g.
8"x18" Porter Cable, collets.

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No. 2 Kemps, Universal, B. G.
No. 2 Kempsmith Plain.
No. 2 B. & S. Plain, B. G.
No. 4B Becker, vertical.
No. 2Y, B. & S. Pl., mtr. drive.
No. 1 B. & S. Plain, cone head.
No. 1 Kent Owens B. B. Hand.
No. 2, Van Norman Sub Head.
No. 20 Van Norman Duplex, Motor Drive.
No. 2A Hendey univ. fully eqd.
No. 1½ B K&T Plain, dbl. over.

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No. 6 Fox "Superflex".
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24" Cincinnati planer type.
24" Stock. b. g. crank, M. D.
20" G & E Hi-Duty SPD Gr. Bx.
16" & 20" Steptoe b. g. crank.
16" Milwaukee, B. G. Crank.

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Bolt Cut., 2½" Landis Lead Scr.
Broach, No. 2 LaPointe S. P. D.
Die Filer, No. 5 Thiel, m. d.
Gear Cut., No. 3—26"—B. & S.
Gear Hobber, No. ½ S. & S.
Nibbler, No. 2 Campbell, M. D.
Planer, 30x30x10' Am. Box Tbl.
Punch & Shr., No. 55 H. & W.
No. 00, M. D.
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Riv. Spin. ⅜" Linley, M. D.
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2" Cleveland Model C
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4 sp. Aveymatics B.B. No. 2
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4 sp. Barnes Camel Back all geared self oiling
2 sp. Colburn No. 2 M.D.

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No. 3 & 12 Barber-Colman
No. 12H Gould & Eberhardt

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Surface, No. 2 Reid, No. 2
LaSalle, No. 2 W. & M. No. 2
Diamond Wet Att.
No. 27 Gardner B.B. M.D.
26" Badger Disc

HACK SAWS
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6x6 Peerless Universal
6x6 Peerless (2)
8x8 Racine M.D.

LATHES
14" Fay Automatics (2)
13x6 Willard q.c.g.
14"x16"x6' Bradfords q.c.g.
14x6 American Grd. Head
16x8 Bradford Geared Head
14x16" American q.c.g.
16x8 Pratt & Whitney 16 sp. Geared Head
18x8 Boye & Emmes
21"x11' LeBlond 12 sp. grd.hd.
24x16 Boye & Emmes q.cg
42"x16' Schumacher & Emmes q.c.g.
24"x52" Harrington Gap

MILLING MACHINES
Duplex No. 3½ Pratt & Whitney
18"x24" Cincinnati Automatic
No. 1½ Valley City Plain
No. 1A & 3A Brown & Sharpe Universal Motor Drive
Vertical No. 1 B. & S. M.D.
Nos 2A & 4B Becker

NIBBLERS
No. 1 & 2 Campbell
No. 0 Gray

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16"x16x4' Hendey

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O.B.I. No. 1 L.&J. No. 2 & No. 3 Toledo
No 19 & 21 Bliss No. 5 Toledo B. G.
Toggle No. 3½ B Bliss
No. 55 Cleve. S.S. 200 ton cap.
No. 102 Cons. Dble. Crank
No. 84 Bliss S.S. M.D.

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4' Dreses S.P.D.

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21" Smith & Mills B.G.
24" Stockbridge M.D.

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B. L. 8 Niagara 8 ft. 10 ga.
No. 316B Niagara Circle
No. 55 Beloit Punch & Shear
Cleveland Single end

TURRET LATHES
No. 4 & 6 Warner & Swasey G.F.H.
No. 4 Warner & Swasey Univ.
No. 3 Foster 2½" cap. Bar. Fd.
No. 2A Warner & Swasey S.P.D.
24" Gisholt 6½" Hole

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Butt 10 KW Thompson
Spot 9 Kw. A.E.F. 20 Kw. Agnew

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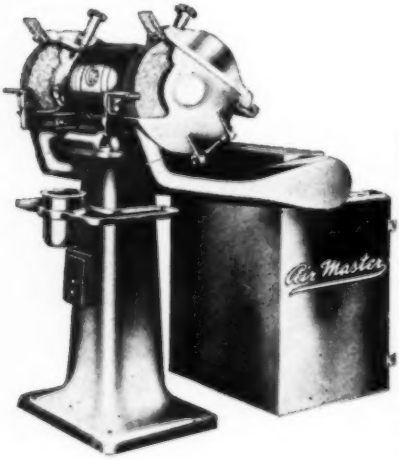

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